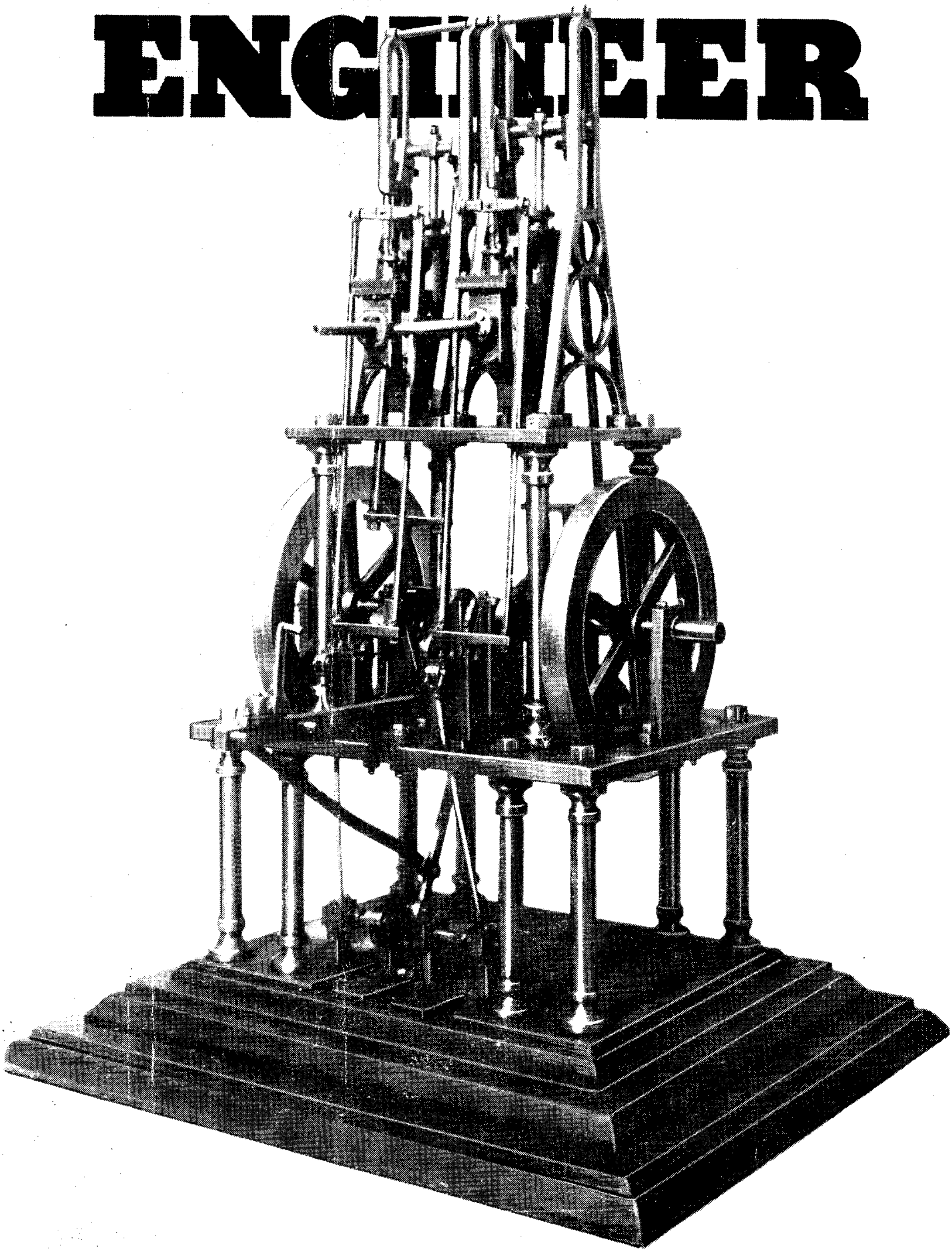
THE MODEL ENGINEER



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The MODEL ENGINEER

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SMOKE RINGS

Our Cover Picture

● THE MODEL shown on this week's cover is of a two-cylinder table engine, built by a well-known model engineer, Fred Smith, of Pinxton, Nottingham. Here again is an instance where model engineering serves to perpetuate a design which might otherwise be lost. The original engine, which was broken up in 1946, was built in 1826 by James Oakes, Riddings Iron Works, Alfreton. It had cylinders 10 in. × 30 in., fly-wheels 6 ft. in diameter and worked at a steam pressure of 40 lb. per sq. in., running at 60 r.p.m. The boilers were Cornish type, about 20 ft. × 6 ft. Except for piston-rods, valve spindles and journals, there was no machining, all rods and other parts being blacksmith hammer finished. Square nuts were used having threads of an unknown pitch. The reversing gear, known locally as the figure eight, is said to have been used long before Stephenson's or Howell's gear was invented. The engine drove a rope drum, which used about 1,000 yds. of 1 in. rope for pulling wagons of coal up an incline. It was also used to work an old atmospheric pump.—P.D.

Is it a Misnomer ?

● WHAT IS a Backhead ? This question has been put to me by a correspondent who signs himself "R.B.", and he goes on to say that his father and grandfather had each been foreman boilermaker with one of our leading ship-building firms. Many years ago, when constructing a boiler for a model locomotive, "R.B." had to ask his father for some advice, and during the conversation referred to the "backhead." The old man replied that there was no such thing as a backhead on a boiler ; the plate referred to is, or should be, correctly called the "boiler front," which is the plate, side or end where the furnace-door is situated. On a locomotive, the smokebox end is the back of the boiler, and the furnace end is the front. This being so, the back is at the front of the locomotive, and the front is at the back ! To me, this seems a bit mixed ; but as I am one of those who have always regarded the cab fittings of a locomotive as being mounted on the back-head, and have known many locomotive men who think the same, I am not, at the moment, prepared to give a straight answer to the question which opens this paragraph. Other readers' views on this matter would be welcomed. Incidentally, the question may be on a par with "How does a steamship *sail* ?" None of them has any sails !—J.N.M.

An Old Friend Passes On

● I HAVE received a letter from Mr. H. C. Sturla informing me of the death, on October 11th, of Mr. Stevens, one of the two brothers whose "Model Dockyard" in Aldgate was so well known

forty and more years ago. The old man had reached his 84th birthday on October 6th, but his brother had pre-deceased him some years ago.

The "Model Dockyard" business, however, had been in existence more than a century, for it had been founded by the father of the two brothers just mentioned; and I am glad to learn from Mr. Sturla that a member of the family, Mr. Dell, intends to carry it on.

But I can remember that, as a young schoolboy, I used to visit the "Dockyard," not to obtain miniature ships' fittings, which were the specialities, but to purchase various small steam fittings that were usually cheaper and more like the real thing than any that could be got elsewhere! Sometimes, I went just to look in the window, because there could usually be seen a number of most interesting model locomotives made entirely of brass! The range of brass wheel castings was astonishing and an entertainment in itself.

And I made the acquaintance of the frequently gruff old man in an apron; he ruled supreme behind the counter and gave the impression that his word was law. Mr. Stevens was *somebody*! But, then, was not his "Dockyard" known all over the world! I hope it will be again, before long.—J.N.M.

The P.R.O.

● A RECENT letter from Mr. S. A. Walter, the genial hon. treasurer of the Harrow and Wembley Society of Model Engineers, tells me that the society has appointed a new Public Relations Officer; he is Mr. L. J. Lawrence, of 3, Leys Close, Marlborough Hill, Harrow, and his appointment reminds me that, in recent years, a number of societies have made similar moves.

The duties of a Public Relations Officer are apt to vary, as between one district and another; but they are always important in that they help to promote among the general public an understanding of our hobby and all that it means to us. Every society has, at some time or other, to rely upon some public support which can only be achieved if public interest in model engineering can be stimulated. The ordinary national and local newspapers can help a great deal, if they are approached in the right way, once they realise that, in a model engineering society or model railway club, they are dealing with a body of responsible people. The same can be said of municipal authorities and other public bodies; but one of the chief aims of a P.R.O., and one that requires considerable tact, is to persuade the general public that model engineering is a man's hobby, and that model railway enthusiasts do not "play trains!"—J.N.M.

Saddle-tank Locomotives

● I HAVE sometimes wondered why one of the "standard" types of locomotives built for the Ministry of Supply during the war was a 0-6-0 saddle-tank, of which quite a large number were built for service on light shunting duties at home and overseas. I have wondered at this because none of the British railways had built any saddle-tank types for many years. The *ex*-Great Western Railway, which, at one time, owned more than 1,100 saddle-tanks, had busied itself converting most of them to pannier-tanks, or building large numbers of the latter type to replace the older engines. The saddle-tank, except for a very few isolated examples, had disappeared from the other railways. Private builders, on the other hand, still continued to build saddle-tank engines for contractors, quarries, collieries and other industries, and it was one of Hudswell, Clarke's proprietory designs which the Ministry of Supply chose for war-time use.

I find it difficult to believe that the construction of a water-tank of semi-circular form, with its tubular apertures necessary to accommodate chimney, dome and safety-valve, is any easier or cheaper than making a pair of plain rectangular pannier-tanks or side-tanks. It certainly isn't in miniature, judging from my own experience; but other people may not agree with me. I would be interested to know what some of the builders of miniature saddle-tank locomotives think about it.—J.N.M.

Another Locomotive Restoration

● IN CONNECTION with the centenary of Waterloo Station, London, an Adams 4-4-0 type locomotive, No. 563, was rescued from the scrap-heap at Eastleigh in order to be restored to the condition in which she and most of her sisters appeared in 1903. Why 1903? The answer is that, in that year, the old Waterloo Station finally disappeared and was replaced by the present magnificent terminus built on the same site.

Engine No. 563 is one of the last four Adams 4-4-0's in existence; all four had been lying for some months on the scrap sidings at Eastleigh, and were waiting to be broken up, after nearly fifty years of service. No. 563 was the one of the quartet that had been least modified from her original condition, and was consequently the easiest to restore.

So carefully has the restoration been done that there is now practically nothing to give rise to criticism. Necessity, however, dictated that the engine be painted in Dugald Drummond's livery of grass-green, bordered with light purple-brown and lined out in black striping and fine white lines. An Adams stove-pipe chimney had to be specially made for her! But she now looks exactly as I first remember her in the early 1900's, and I hope she will be permanently preserved.—J.N.M.

A Grimsby Exhibition

● THE GRIMSBY and District Society of Model and Experimental Engineers has arranged for an exhibition to take place on November 22nd to 27th, at the Augusta Street Barracks. Entry forms are now ready and intending exhibitors should contact the Secretary without delay. The Society's Cup is offered for the best model in the Exhibition and the usual cash awards and diplomas in all sections. There is every prospect of a good display of models, demonstrations of "round-the-pole" racing cars and "line control" aircraft, in addition, a passenger-hauling railway and airline operated models. Full particulars from the Secretary, J. Tarttelin, 101, Ladysmith Road, Grimsby.—J.N.M.

Make Your Own Challenge Cup

by A. R. Turpin

THE real reason I have written this article is not to save clubs the expense of buying challenge cups, but rather to draw attention to the art of the silversmith, because I am certain the model engineer can learn a lot that will help him by studying that art. After all, there is not much difference in "raising" a sugar bowl in silver and hammering out a model car body in aluminium.

My interest began about six months ago, when I was trying to find a book on sheet metal working that really explained the craft and did not dismiss, in a few pages, the use of hand tools. It was whilst I was scanning the shelves of the local public library that I came across *The Silversmith's Handbook*, and found that it was the sort of book I had been looking for. I would warn readers, if they, too, hunt in their local library, to look under both "Art" and "Crafts," as each each librarian has his own idea as to which section it should be under.

Photo No. 1. *The cup*

The cup shown in photograph No. 1 is a copy of what has been described as the most beautiful wine cup in existence. I do not say that this also applies to my copy, because it is not an exact replica of the one in the Victoria and Albert Museum; but it is as near as I could get to it from the rough sketches I made during a quick visit to that place, and besides, except for a small ash tray, it is the first bit of silversmithery that I had tried.

But there is danger in this craft. When I brought the cup out of the workshop and showed it to my wife, she looked at it with surprise and interest and said, "So you *can* make something useful in that workshop. This has possibilities!" My wife's "possibilities" are shown in photograph No. 2 and are the result of three months' hard labour.

However, to get down to the production of the cup. Very few tools that are not to be found in the average workshop are required, and these can either be made by oneself or purchased for a few shillings. For the cup in question we require a block of wood about 4 in. × 4 in. × 4 in., in the end of which is gouged a shallow oval depression about $1\frac{1}{2}$ in. × 1 in. × $\frac{1}{4}$ in. deep (Fig. 1A) and a "raising" stake. This is made from a piece of $2\frac{1}{2}$-in. round bar about 2 in. long, one end being domed to the curvature of the cup. This end can be spherically turned or turned by eye with a hand tool, working to a template. The hard edge should be smoothed off with a file, so that it blends smoothly into the periphery of the bar. A $\frac{1}{2}$-in. diameter hole is then bored 1 in. deep in the bottom, so that it can be pushed on to the end of a length of $\frac{1}{2}$-in. diameter steel rod held in the vice (Fig. 1B). The domed portion should be given a high polish by revolving it in the lathe, and using successively finer grades of emery-cloth, finishing with flour emery and oil. If the stake is to be used to "raise" a mild-steel panel, the head should be hardened, but for the softer metals, this is not necessary. A boxwood mallet will be required and this must be shaped as shown in Fig. 1C, by sawing and filing.

Be careful to round all corners, otherwise the wood will be inclined to splinter. The final tool for the work in hand is a planishing hammer, (Fig. 1D), and an excellent one can be made by buying a cobbler's hammer from Woolworth's, and after having domed the face slightly, give it a high polish.

Now take a piece of wire and bend it so that it follows the curve of the bowl of the cup as Fig. 2. Cut it to the length of the outline, then straighten the wire—this is the diameter of the copper or silver disc required for the bowl. In a deep bowl, this method will not hold good, as the metal will

stretch in the "raising," but in the case of this shallow bowl, the extra gained will be the amount required for trimming when the bowl is finished.

Now as this is a first effort, it is advisable to work in copper and bronze, and have the finished article silver-plated afterwards if the craftsmanship warrants it. So take a piece of soft copper sheet, any gauge from say 18- to 21-s.w.g., and cut out a disc of copper the desired diameter with a pair of hand shears, a circle having first been scribed with dividers, and make the centre-pop really deep, so that you don't lose it, as you will work from this centre from now on. File up the edges round and smooth, remove any deep scratches by scraping, anneal by heating to a dull red, quench in water to remove most of the oxide, and we are ready to start.

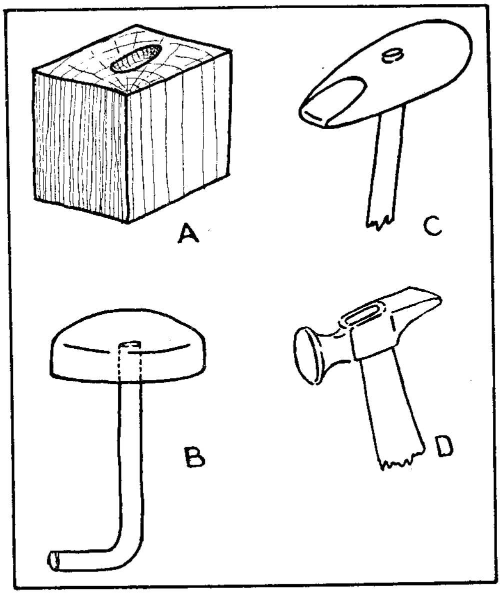


Fig. 1. The tools

With a pair of pencil compasses, draw concentric circles about ½ in. apart, starting 1 in. from the centre. Now put the wood block in the vice, and holding the copper disc at an angle with the outside pencil line over the centre of the hollow in block, hit on the line with the sharp end of the mallet, this will cause the edge of the disc to bend over, rotate the disc ½ in. or so and hit again. Repeat until you return to the starting point. Now repeat the procedure, but this time along the pencil circle nearest the centre, and continue the process until the edge is reached once again. You will now have what will most likely look like a horribly dented copper saucer, but don't let that worry you ; it will all come right in the end, at least I hope so ! The reason that we made one circuit on the edge to start with was to harden it, so that subsequent malleting on the inner circles did not distort the shape too much. Now, after this hammering, the copper will be very hard and springy from the cold working, so anneal again and repeat the procedure. After about three or four hammerings, we shall have turned the saucer into a shallow bowl, and we can now start the "raising" proper.

First we anneal again—as we always do as soon as the copper feels hard—and then transfer the centre dot to the outside of the bowl (it will most likely show through the copper but if it doesn't, give it a tap with a centre punch). Draw your circles again, but this time on the outside of the bowl, and start ½ in. from the centre. Now fix your domed iron stake so that the rod is vertical in the vice, and place the bowl over it. Holding the top edge really firmly, adjust it so that the centre of the bowl is touching the domed part of the stake, and then strike the innermost pencil line with the planishing hammer.

I would mention here that normally one would use a "raising" hammer for this job, but as we want to keep the number of tools to a minimum, and the bowl is very shallow, we shall be able to manage the job with the planishing hammer quite well.

Now the important thing about "raising" is that we do not hit the copper directly over the point of contact with the stake, but a little above it (see Fig. 3), so that if we hit hard enough, and hold the bowl firmly enough, we bend the metal down on to the stake, and we may have to hit the same spot twice or three times before this happens, but if we are doing the thing correctly, we shall hear a sharp metallic ring as the metal hits the stake. If we strike immediately over

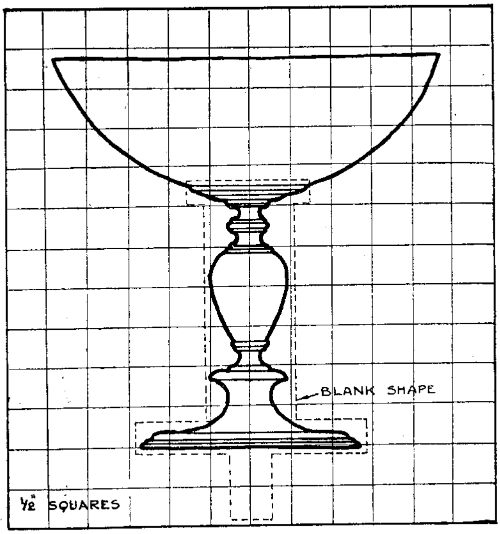


Fig. 2. Outline of the cup

the stake, all we shall do is smooth and stretch the metal without altering the contour, which is what we want to do at the moment.

So having made our blow as instructed, we rotate the bowl slightly and repeat the dose until we arrive back at the starting point, having made a kind of shallow step all around the bowl ;

we then move up about $\frac{1}{4}$ in. and go round again in the same way. The hammer blows will have to be quite hard to make an impression, but be careful, when you reach the very outside, to make your blows softer so that you do not spread and thin the edge.

Having reached the edge, the bowl should look more like a portion of a sphere than it did, but it may still not be quite the right shape, so go over it again, and if necessary a third time until you are quite satisfied. When it looks as nearly as possible the right curve, run your hand over it, you will be able to feel inequalities better than you can see them.

We are now ready for planishing, but before starting on this we must anneal again, and then pickle in a 5 per cent solution of sulphuric acid and tap water (add the acid to the water) which will remove all the oxide and the bowl will come out after ten minutes soaking a beautiful salmon pink colour. Rinse and dry.

Now carefully polish up your stake and hammer, draw the circles again, and start your planishing. This is done to smooth out the rough hammer marks and not change the shape of the bowl; in fact, at this stage, the shape should be that of the stake so that the bowl practically touches it all over, and so when you strike a blow, it should be at a point where the copper is in contact with the stake; and further, the blows should be quite light; in fact, so light that if you do hit your finger by mistake it would not cause much worry. Start your planishing at the very centre of the bowl and work round in circles so that each hammer mark overlaps its neighbour. You will be able to see the hammer marks quite plainly because they will show as a small polished spot about $\frac{1}{4}$ in. diameter. Having planished a small portion of the bowl, examine the inside, which should also appear quite smooth and polished; if it does not, increase the strength of the hammer blows and try again. Having gone over the whole bowl in the manner described, anneal and pickle once more, and then very carefully scribe a line to give the correct position of the rim, because as it stands, the bowl will be slightly too large and the rim will be quite ragged and uneven. Trim off the surplus edge with curved shears and file smooth, then replanish the whole again, but this time use much lighter blows, so that the hammer marks are about $\frac{1}{8}$ in. diameter. At this point we can do some rough polishing, as it is easier to carry out before the stem is attached, especially if we are using a bob. However, we first have to decide whether we wish the hammer marks to show or not; personally I like them to show slightly, and the amount that we allow them to show depends on the amount of rough polishing we carry out. If you have no bob, rub down lightly with medium grade emery-cloth and follow this with finer and

Photo No. 2. Three months' hard labour!

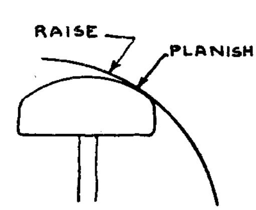


Fig. 3. Where to hit the bowl when "raising" and planishing

finer grades, finishing with water and pumice powder. The minimum number of bobs required will be three, two calico and one swansdown. By the way, swansdown is really a soft cloth bob, and not feathers. If these bobs are not larger than 6 in. diameter, they can be used for the inside of the bowl as well, and should rotate at about a periphery speed of 6,000 ft. per minute.

Use 180-grit emery on the first bob, grease tripoli on the second and rouge on the swansdown bob.

To coat the emery on the first bob, make some Scotch glue, using about a third more water than the glue will absorb when soaked for 24 hours. Make a shallow trough of wood the same width as the bob when compressed, and put some emery in the bottom of the trough. Warm the bob well by rubbing on a piece of hot metal, then quickly apply the hot glue. Now, holding the edge together, push the bob between the sides of the trough and roll it quickly on the emery, rotating the bob as necessary, and then allow to dry for 48 hours. Before coating a new bob, rotate it against the edge of an old file to true it up, and against a scrap piece of metal after coating. Only very gentle pressure should be used against this wheel, especially when newly coated, unless the hammer marks are to be completely obliterated.

After the emery bob, use the tripoli one. Here considerable pressure will be required and the amount of power required to drive these polishing heads will now be appreciated. At least ½ h.p. is wanted to make any real impression on the scratches left by the emery bob. The work will get very hot and will have to be continually dipped in water to cool it; anyway, it is a good idea to wear old gloves whilst doing this job, as it will save the hands considerably. Watch out for the bob catching the edge of the bowl by always polishing away from it; if you don't take this precaution, you will soon have the bowl snatched from your grasp and hurled across the workshop. After polishing with the tripoli bob, we can now leave the bowl for a bit, and start on the stem.

The stem is best made from a bronze casting. A pattern should first be made in wood. If only one cup is to be made, the pattern may consist of two flanges at either end of a plain bar, and the rough casting from this accurately turned up to shape by hand. If, however, a number are to be made, the pattern should be turned to the finished shape, allowing about $\frac{1}{16}$ in. all over for machining, this amount being allowed both sides of the base. If the foundry is a good one, considerably less than this may be necessary. If we were working in real silver, an accurate core box would also have to be supplied.

It will be found very convenient if a spigot is cast on the base for chucking.

Having obtained your casting, chuck the small end in the lathe, and centre the spigot with a Slocombe drill, reverse and centre drill the small end, and then mount between centres. The bottom of the base may now be turned up, recessing same $\frac{1}{16}$ in. to within ¼ in. of the edge, then reverse stem and turn to the finished shape with a hand tool. For this work, I use a 1½-in. × ¼-in. diameter high-speed tool bit mounted in a ¼-in. diameter hole drilled in the end of an 18-in. length of ½-in. diameter B.M.S., the bit being held in position by a small Allen screw.

If both ends of the H.S. bit are shaped, two lengths will be required, and from these we can make diamond, round, chisel and concave shaped tools. The bit should project about 1 in. from the end of the holder and lie on the tool rest, which should be as near to the work as possible, and in the case of the base and top, set at the approximate angle of these two flanges. Having turned up the stem, replace the tailstock centre with a "D" centre and turn the small end to the curvature of the bowl. The fitting need not be accurate, as long as the outside beds accurately on the bowl. Whilst still between centres, polish with emery-cloth and fine steel wool.

We now return to the bowl, and carefully scribe a circle the same diameter as the small end of the stem in the position it will occupy on the bowl. Now take a fine graver and raise some 5 or 6 "stitches" round this circle. To do this, push the graver into the copper about $\frac{1}{16}$ in. on the inside of the scribed circle and continue until the circle is reached; this will raise a small curl of metal, and if we now place the bowl face-down we can stand the stem within these raised curls of metal, positioning it accurately without fear of it slipping whilst silver-soldering it in position, which will be the next operation.

Now carefully scrape the bowl and the stem where they will come in contact, make a paste of "Easyflo" flux and paint on two coats, allowing the first to dry before applying the second.

Now paint a wide band of lampblack (poster colour will do), around the bowl, as close to the scribed circle as possible to prevent the solder running where it is not wanted—the experts need not bother to do this—place bowl face-down on a firebrick and we are ready to heat up. Have a stick of "Easyflo" solder ready with the end scraped and fluxed, and start heating up, keep the flame moving so that the whole is evenly heated, and when brazing heat is reached apply the solder to the joint. It should run at once, and ½ in. of solder applied at one spot only should be enough. Allow to cool slightly and then carefully examine the joint before adding more, because it is much easier to put solder on than to take it off.

If the joint seems to be perfect, place the whole thing in acid pickle and then rinse and clean up carefully, using a dead smooth file to remove any surplus solder or the "stitches" if they show.

Now, using a piece of emery glued to a board, or carborundum powder on a sheet of glass, grind down the lip dead true, the stem making a convenient handle for this job.

Finally, polish with the tripoli bob and follow with rouge on the swansdown bob.

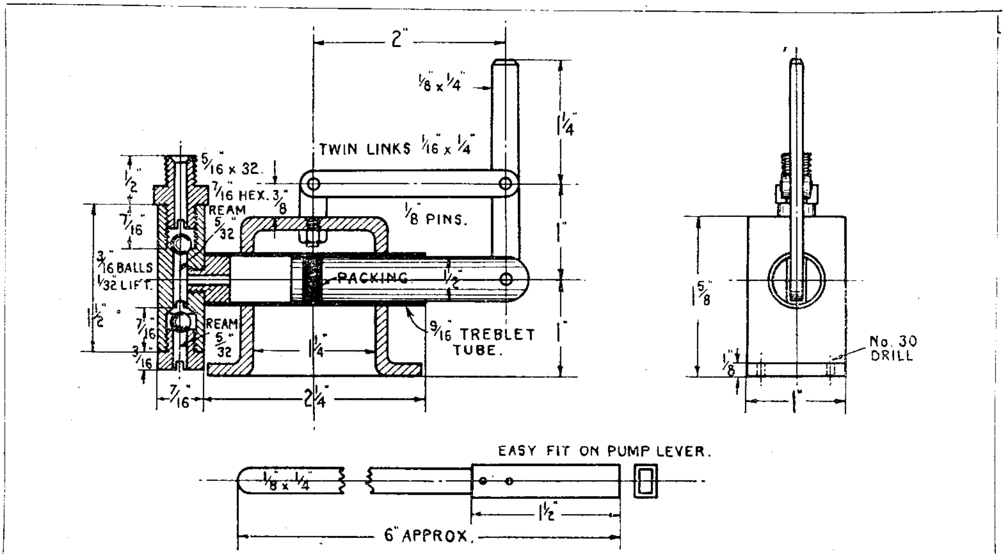
Now the only thing left to do is the silver-plating, and this is best left to a professional; not that silver-plating is a difficult job, but the two salts used are two of the most powerful poisons known; mercuric oxide and potassium cyanide. These chemicals can only be obtained with great difficulty, and rightly so, and the plating will cost considerably less than the materials to plate the cup oneself.

"MAID OF KENT" and "MINX"

How to Test Boiler

by "L.B.S.C."

FOR beginners' benefit I will run through the boiler-testing ritual again. It is an important job, though very easy, and eliminates all risk of a big bang, not to mention personal injury, in extreme cases where the workmanship is not exactly first-class. Under the water pressure, I might remind tyros and novices, any faulty joint or piece of metal in the boiler will give way without explosion ; in fact, usually without even a sound. As the mere fact of it giving out, instantaneously releases the pressure, there is not the slightest danger. You could test a boiler to 500 lb. per sq. in., if such a pressure were necessary, with exactly the same security. In passing, may I remind builders of the L.M.S. "Doris," that all instructions in boilersmithing, thus far given, apply to their boiler as well, and so when I give the drawing, there should be no need to go through the whole rigmarole again. Same applies to the testing operation.



Details of the tender pump

All that we need for testing, are a pump, a pressure gauge, and a few plugs and adaptors. The engine's own emergency tender hand-pump will do the trick fine, so I am giving a drawing and notes about it right away. Make it, and put aside after the test, until needed to install in the tender. The best gauge for the purpose is one off a full-sized locomotive, or its equivalent. I've often been facetiously asked where I "won" mine, but as a matter of fact I gave twelve shillings for it at Willcox's in Southwark Street, Borough, just after the end of the Kaiser's war. It is a full-sized locomotive gauge with centre-pivoted needle, and reads to 360 lb. ; it has been used for testing every boiler I have made during the last 28 years or thereabouts, and is still perfectly accurate. Any gauge will, however, serve our purpose as long as it is reasonably accurate, and reads to 200 lb. or more. Don't on any account try to use the little gauge intended for use on the boiler, or as the kiddies would say, you'll "do it in." As to the plugs and adaptors, they are easily made from any scraps of brass rod, and as long as they are capable of being screwed up watertight, it doesn't matter a Continental what their personal appearance is like. There is one hole we can't temporarily plug up easily, however, and that is the dome bush, so we might as well make the inner dome and fit it right away.

Inner Dome

This is the same on both "Maid" and "Minx." The body of it is a piece of 16-gauge seamless copper tube, $1\frac{3}{4}$ in. outside diameter, squared off at each end in the lathe to a length of $1\frac{1}{4}$ in. One end of this is closed by a disc of 13-gauge (3/32-in.) sheet copper. If you cut out a piece a full $1\frac{3}{4}$ in. square, drill a $\frac{5}{16}$-in. hole in the middle, and clamp it on a bolt between two nuts, you can hold the end of the bolt in the three-jaw, and turn the piece of metal circular, until it is a drive fit in the end of the tube. If you snip or

saw off the corners before starting to turn, it makes the job easier. After driving it in, chuck the tube in three-jaw, disc outwards, and ream out the hole to $\frac{3}{8}$ in. diameter. Make and fit a bush to it as shown in the section, using $\frac{1}{2}$-in. diameter rod, either copper, bronze or gunmetal; tap it $\frac{1}{4}$ in. by 40, and slightly countersink the end. I usually make my boiler bushes from thick-walled copper tube, which stands up to being brazed, better than any cast or extruded metal.

The flange is made from a piece of $\frac{1}{8}$-in. copper plate about $2\frac{3}{8}$ in. square. Drill a hole in the middle, saw off the corners, mount on an old bolt as above, and turn the edge to $2\frac{1}{4}$ in. diameter. Then chuck it in the outside jaws of the three-jaw, and bore out the hole to $1\frac{3}{4}$ in. diameter, a tight fit over the tube. Squeeze it on until $\frac{1}{8}$ in. from the open end; then silver-solder the whole issue at one heat, letting little fillets of silver-solder lie around the ring or flange, between it and the tube, also around the disc at the end, as shown by the little black triangles in the illustration. Don't forget the bush at the top. Pickle, clean, and drill the twelve No. 30 holes for the screws, equidistant around the flange; then chuck the dome in three-jaw with the flange outwards. Set to run truly, then take a skim off the contact side (underneath) of the flange, so that it makes a true joint with the top of the big bush in the boiler. Put it in position, then locate, drill and tap the holes in the bush on the boiler, exactly the same way as you did the tapped holes for the screws holding the cylinder covers to the casting. Use No. 40 drill, and tap the holes either $\frac{1}{8}$ in. or 5-B.A., putting the dome in place with a 1/32-in. Hallite or similar jointing gasket between the flange and the dome bush. Any screws will do for the test, so long as you use brass screws for final assembly.

Maybe one or two of our enterprising advertisers will supply a bronze or gunmetal casting for the inner dome. If so, there will be very little machining needed; chuck the casting in three-jaw, flange outward, and turn bottom of flange and casting, to fit in the dome bush on the boiler. Reverse in chuck, drill the top and tap it, as shown for the bush in the built-up job, and face off. Drill the screwholes in the flange, and fit as above. Note, if the casting is very thick, chuck again, open end outwards, and bore out the inside, same as you would bore a cylinder, until the wall is 3/32 in. thick. If the inside is too small, the regulator valve won't fit in.

Tender Hand Pump

Although no castings are actually needed for the hand pump shown in the illustration, castings are already available for the arch-shaped stand, with a lug on top for the anchor links; and these may, of course, be used if desired. In the ordinary course of events, the stand is made from a piece of brass or copper 1 in. wide and $\frac{1}{8}$ in. thick, bent up as shown. It will bend easily enough if heated to bright red and quenched out in clean, cold water. The lugs at the bottom are a bare $\frac{1}{2}$ in. wide. Drill a No. 30 hole near the corner of each lug, for the fixing screws; another ditto in the top, for the shank of the lug holding the anchor links; and a $\frac{9}{16}$-in. hole in each side, for the pump barrel. Set out these holes 1 in. from the bottom, with a scribing block, then drill $\frac{1}{8}$-in. pilot holes, open out with 17/32-in. drill, and finish with a reamer, so that the holes are an exact fit for the pump barrel. This is a $2\frac{1}{4}$-in. length of $\frac{9}{16}$-in. brass treblet tube, which will be perfectly smooth and true inside, and requires no boring. Square off the ends in the lathe. If you have to use a piece of ordinary brass tube, either true it up by reaming, or else put a piece of round wood in the chuck, with sufficient emery-cloth wrapped around it, to fit loosely in the tube. Run the lathe as fast as possible, and run the tube up and down the improvised lap. This will soon teach it good manners. Don't forget to spread a paper underneath to protect the bed and slides. Emery-dust is jolly fine stuff for certain purposes, but it doesn't exactly shine as a lubricant, nor as a preserver of truth in sliding joints.

Chuck a bit of $\frac{9}{16}$-in. or $\frac{5}{8}$-in. round brass rod in three-jaw, turn down $\frac{1}{4}$ in. of it to a tight fit in the pump barrel, face the end, and part off at $\frac{7}{16}$ in. from the end. Reverse in chuck, turn down $\frac{3}{16}$ in. of that end to $\frac{1}{4}$ in. diameter, and screw $\frac{1}{4}$ in. by 40. Centre, and drill a $\frac{1}{8}$-in. hole right through. Squeeze it into the end of the pump barrel.

Valve Box

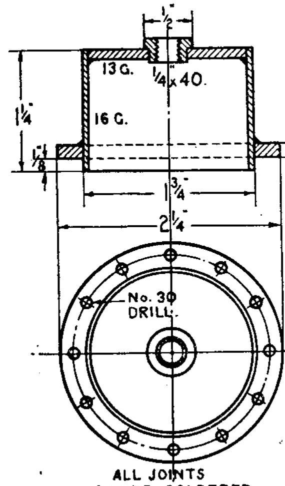
Part off a $1\frac{1}{2}$-in. length of $\frac{7}{16}$-in. round brass rod. Chuck in three-jaw, centre, and drill a No. 24 hole clean through. Open out for $\frac{3}{8}$ in. depth with 9/32-in. drill, and bottom with same size D-bit to $\frac{7}{16}$ in. depth. Tap $\frac{5}{16}$ in. by 32, slightly countersink the end, and skim off any burr. Reverse in chuck, and repeat operation, except that the D-bit need not be used. Run a 5/32-in. parallel reamer through the remains of the No. 24 hole, and nick the end of the "no-D-bit" hole with a little chisel made from $\frac{1}{8}$-in. silver-steel. Drill a 7/32-in. hole in the side, halfway along, breaking into the $\frac{1}{8}$ in. reamed hole; tap it $\frac{1}{4}$ in. by 40, and screw in the spigot on the end of the pump barrel. Push the barrel through the holes in the stand, set the valve box upright, D-bitted end at the top, and solder the joints with ordinary "soft-tommy"; this will be O.K. as there is no heat to withstand, and the barrel tube doesn't get softened, as it would do if the whole issue were silver-soldered.

The valves are $\frac{3}{16}$-in. balls, of rustless steel or bronze, and as they are fitted, and the caps made, exactly as already described for the eccentric-driven and crosshead pumps, there is no need to detail out the whole story again. Suffice it to say that instead of the suction-valve cap being finished off with a union screw, the hexagon part is cut off flush, and cross-slotted with a thin flat file such as key cutters use for forming wards in keys, as shown in the section.

The ram is a piece of $\frac{1}{2}$-in. round rustless steel or bronze, $2\frac{7}{16}$ in. long. One end is slotted $\frac{1}{8}$ in. to take the lever, and cross-drilled No. 32 for the pin. The other end has a groove turned in it, $\frac{3}{16}$ in. wide and $\frac{1}{8}$ in. deep. The best material for pump packing is a strand or two unravelled from the rope-like braided stuff used for full-size pumps at waterworks pumping stations and other industrial plants. If this cannot be obtained, use ordinary graphited yarn. The oldtimers

used tallowed flax (we did for the pump glands on the L.B. and S.C.R. engines) but this has a tendency to set hard and score the bores ; and in addition, causes a green deposit to accumulate on the brass, which my old granny called " verdy grease " when she saw traces of it around the gland on the kitchen tap. The $\frac{1}{2}$-in. diameter rod should be a perfect sliding fit in the treblet tube ; but if it isn't, or if you have used tube which is slightly under or over size, a piece of rod the nearest size larger, must be turned to fit.

The lever is a $2\frac{1}{2}$-in. length of $\frac{1}{8}$-in. by $\frac{1}{4}$-in. brass or nickel-bronze rod drilled at the spacing



The inner dome

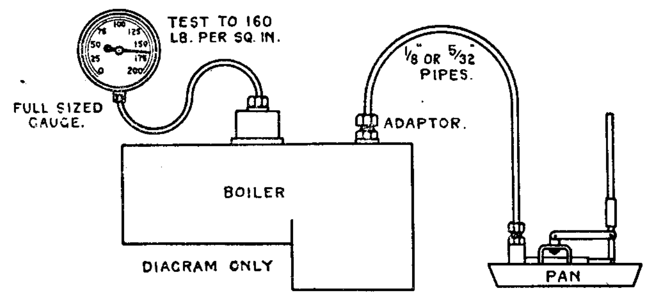
shown with No. 30 drill. Bevel off the top and round off the bottom. The twin links are made from $\frac{1}{16}$-in. by $\frac{1}{4}$-in. rod, same material, and are drilled No. 32 at 2-in. centres ; round off the ends. The anchor lug is turned up from a bit of the same material used for the lever, the shank being turned with the rod chucked truly in four-jaw, and screwed $\frac{1}{8}$-in. or 5-B.A. The pinhole is drilled No. 30 at $\frac{3}{8}$ in. from the shoulder. The whole issue is assembled as shown, using bits of $\frac{1}{8}$-in. rustless steel or phosphor-bronze for pins.

An extension handle, for operating the pump through the filling-hole on the tender, is made by driving a $1\frac{1}{2}$-in. length of commercial brass rectangular tube on to the end of a 5-in. length of rod, the same section as the pump lever. Steel may be used for this, if desired, as it doesn't get wet. If you can't get any rectangular tube, make it by bending a bit of 18-gauge sheet metal around the handle, and silver-soldering the corner joint.

The Rig-up for Testing

Plug up the holes in the boiler with turned and screwed brass plugs, except the one in the dome, and a safety-valve bush. The adaptors fit these, and are merely plugs with the upper end screwed to take a $\frac{1}{4}$-in. by 40 union nut ; they are, of course, drilled right through. Connect up the pressure-gauge to the dome, with a piece of $\frac{1}{8}$-in. or 5/32-in. tube having a union nut and cone on both ends. Couple up the delivery end of the pump likewise, to the safety-valve bush, standing the pump in a pan of water. Before screwing up the pressure-gauge union, fill the boiler with water right up to the top of the dome. Before starting the test, make quite sure that all plugs and unions are well tightened up, or the test won't be effective.

A very few strokes of the pump will run the pressure-gauge up to 50 lb., and at that point stop and take a look at the way things are shaping. If any pinholes or other small leaks show, let



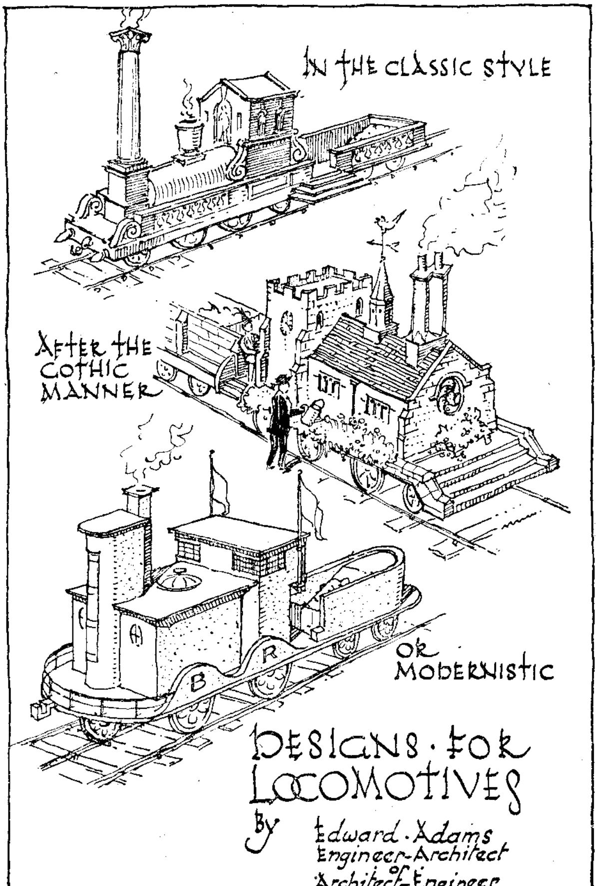
Rig-up for boiler testing

off the pressure, empty out the boiler, and see to these before proceeding any farther. If all are O.K. pump up to 100 lb. and make another inspection. Should there be a slight movement of the firebox crown sheet, or, in fact, any part of the boiler, don't worry about this at all, as it is only the soft copper sheet settling itself into the best possible position to resist pressure. If still all right, go up to 130 lb. and finally to 160 lb. Leave this on for a little while, say 20 to 30 minutes ; and if at the end of that time, the boiler is still tight, and nothing has distorted or given out, you can pass it as O.K. and it will be all right for the lifetime of the engine. Beginners and other inexperienced workers should note that there is not the slightest need to test to a higher pressure than double that at which the boiler will normally work, as excessive test pressures do no good whatever, and merely tend to strain the boiler. As a matter of fact, full-size boilers are not tested to anything like double the working pressure, for this very reason, but only to what the C.M.E. considers a safe limit. If the boilers for " Maid," " Minx," and " Doris," or in fact any of the locomotives described in these notes, will stand a test pressure of 160 lb. without leakage nor collapse, they are perfectly safe to work at 100 lb. pressure if required ; but unless I miss my guess, the engines will do more than you ever require, or even expect, with a working pressure of 80 lb. One of the engines I rebuilt whilst over in U.S.A., with cylinders $1\frac{1}{2}$ in. by $2\frac{1}{4}$ in. and 6-in. driving wheels, started a ten-car train loaded up with bits of full-size rail, total load behind the tender 1,992 lb., from a dead stop on a 1 in 75 grade, with only 75 lb. showing on the steam gauge. The late Mr. Calvert Holt, and the owner of the engine, both witnessed this mighty effort ; and if the

smokestack had jumped clean off the smokebox and disappeared "into the blue," none of us would have been the least surprised. Neither before, nor since, have I ever heard an engine of that size loose off such terrific exhaust barks. I had fitted her with $\frac{3}{4}$-in. piston-valves and one of my pet valve settings. She could pull three tons on the level. Given reasonable workmanship, the "Minx" should be able to equal or better that. Next stage smokebox and fittings.

Let Us Smile!

Followers of these notes will recollect that I suggested that those two ardent lovers of locomotive grace and beauty, Messrs. F. C. Hambleton and J. N. Maskelyne, should set on record what they consider to be a suitable outline for the future express passenger engines of British Railways, and I would endeavour to supply the "works" for a $3\frac{1}{2}$-in. gauge edition. Up to the present they have been too busy—I still live in hopes, for I am certain the engines would be what the kiddies call "real smashers" — but another well-known party, in jocular vein, has set down the suggestions reproduced here. I sincerely hope "Bro. Ted" doesn't expect your humble servant to supply the needful to make them go—the boiler of the middle one would need a bit of staying, though I see he has "pulled a fast one" on the L.M.S., or rather the London Midland Region, by specifying a double chimney!



It's No Use!

This week, time of writing, I received a letter from a raw recruit complaining that he was building a boiler for a "Juliet," and was in difficulties because he could not get the brazing strip to run. He said he was following my instructions, but was using a small gas blowpipe of the kind sold for connecting up to an ordinary gas tap. As he couldn't melt the brazing strip, could he use silver solder? Well, I have stated time and time again in these notes, that for successful brazing you need *heat*, and plenty of it. Despite what is said in advertisements and elsewhere, these small gas blowpipes are utterly useless for boiler brazing. They are excellent tools for small jobs within their capacity, such as silver-soldering up boiler fittings and suchlike; but they simply haven't the "therm" capacity for serious work.

That reminds me of an incident which occurred soon after the Kaiser's war. It so happened that somebody came into a shop and enquired about a blowpipe for brazing a $3\frac{1}{2}$-in. gauge boiler. The only blowpipes stocked were the little self-blowing ones similar to those mentioned above, at that time selling for five shillings; but this didn't deter our salesman in the least, who assured the customer that it would be quite satisfactory. When the latter departed with his purchase, I said to the salesman, "You shouldn't have told him that blowpipe would braze his boiler; it's useless for the job." The salesman merely grinned and said "Never mind that—I made a sale, didn't I?" I am thankful to say I never heard of a similar case; but at the same time, beginners and inexperienced workers should always be on their guard, and deal only with reputable advertisers.

For "Juliet's" boiler, a five-pint paraffin blowlamp, or an equivalent air-gas blowpipe, fan or bellows operated, is desirable. An experienced worker, such as a professional coppersmith, could do the job quite well with a smaller blowlamp, say a $2\frac{1}{2}$ pint, as he would know exactly how to arrange his coke or breeze packing, to get the extra heat from it.

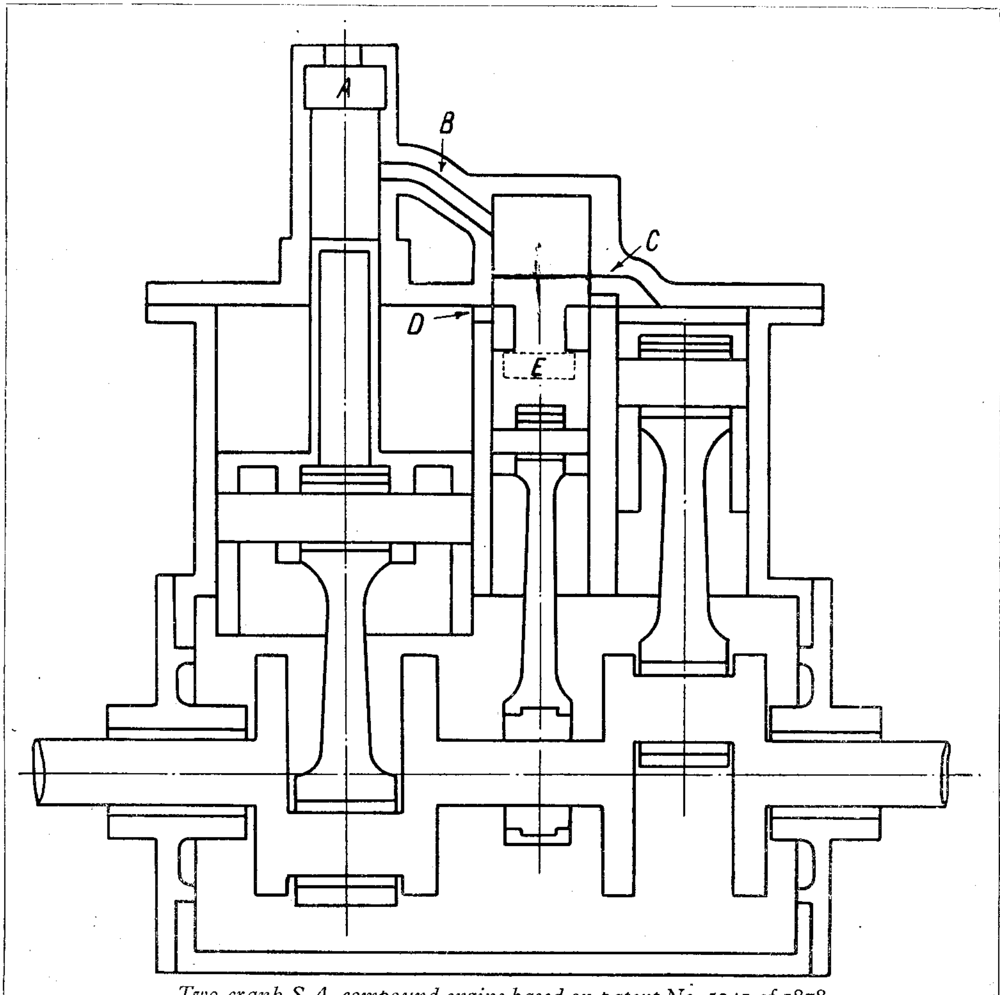
Referring back to our querist's enquiry about silver-solder, even this needs a dull red, so his weeny blowpipe would still be useless. I advised him to try and borrow a big blowlamp, as it was the only practical solution of his problem.

A Two-Cylinder Compound Engine

A Suggestion for a Power Unit for a Light Steam Car or Steam Bicycle

by Kyrle W. Willans

READING through the many patents taken out by Peter Willans between the years 1874, when he took out his first patent for an enclosed-type steam engine, down to the date of his death in 1892, the writer has been struck by the wide range of the patents. While he would like to give some details regarding them, the purpose of this article is to deal with patent No. 5341 of 1878, mainly because it looks, on the face of it, that an engine built on the lines laid down in that patent will be simple to construct and economical in steam consumption. The writer cannot trace any account of engines having been built under this patent, but there are references in Lloyd's yacht register of 1894 to launches built at Thames Ditton by Willans & Robinson



Two-crank S.A. compound engine based on patent No. 5341 *of* 1878

which were fitted with two-cylinder compound engines and not with the normal 3-crank single-acting engines.

Patent No. 5341 of 1878 describes a two-crank single-acting compound engine having one single piston-valve distributing the steam to the two cylinders. From the claims it would appear that this was the first patent covering the subsequently well-known principle of one valve for two cylinders with cranks at 180 deg.

Nothing Remarkable

There would not be anything especially remarkable, or shall we say "modelworthy" about a two-crank single-acting compound engine with cranks at 180 deg. if that was the sum total of the invention. There is, however, a most interesting feature in the engine, and that is the way that variations in cut-off are obtained without any form of link motion or variation of action of the valve distributing steam to the H.P. and L.P. cylinders. The cut-off is applied only to the H.P. cylinder, and the point of admission is in no way affected by variations in cut-off.

It would appear, from the first patent drawing, that the original idea was to construct a single-acting compound engine operating on the "constant thrust" principle, which was a feature of all Peter Willans' engines. It is difficult in these days to realise that so little was known about bearings and lubrication that the three-crank Willans engine built under patent No. 974 of 1874 was in a class by itself for silent running over long periods and freedom from trouble.

"Constant Thrust" Maintained

In the engine under consideration "constant thrust" was maintained in the H.P. cylinder by the fact that there was always pressure sufficient in that cylinder to keep the upper half of the big-end bearing in contact with the crank pin. The lower half of all big-end bearings consisted simply of a steel strap not in contact with the pin and only there as a safeguard. It will be appreciated that if the strap was not there it would be possible, in fact probable that if the crank was turned by hand the pistons would hang up in the cylinder, and the connecting-rod swing off the crank pin. If this were to have happened and steam was turned on, then disaster would undoubtedly have followed.

"Constant thrust" in the L.P. cylinder was brought about by fitting a tail-rod to the L.P. piston-rod and allowing the tail-rod to move up and down in a cylinder open to full steam pressure.

The Use of the Tail-rod

It is probable that the existance of the tail-rod led to the plan for using the aforesaid tail-rod to cut off steam to the H.P. cylinder by making the cylinder in which the tail-rod worked the H.P. steam chest. By this means a fixed cut-off of any desired percentage of the stroke could be brought about by admitting steam to the H.P. piston-valve through a port in the side of the L.P. tail-rod cylinder and cutting off steam admission to the H.P. cylinder by the upward movement of the tail-rod on the exhaust stroke of the L.P. piston.

In the patent specification drawings, P. W. Willans proposed to vary the cut-off at will by rotating the tail-rod in its cylinder and providing the cut-off edge of the tail-rod with a scroll form that would give varying cut-off points corresponding to positions of the tail-rod. Willans even envisaged controlling the speed of the engine on the cut-off by using the governor to rotate the tail-rod, but it does not appear probable that the method of rotating the tail-rod would have been satisfactory for the purpose.

The drawing gives a general idea of how the writer would approach the design of an engine operating on the system covered by Patent No. 5341 of 1878, but nowadays, with the knowledge we have relative to the production of bearings which run for thousands of hours with complete silence, it is not necessary to build the engine to operate on the principle of "constant thrust." The writer would, however, propose to use a two-bearing crankshaft with an eccentric sheave mounted between the two throws to operate the piston-valve.

Two Cut-off Positions

In place of the rotating tail-rod the writer proposes a tail-rod firmly attached to the L.P. piston and having a straight leading edge. To obtain say two cut-off positions (and that should be ample) the writer suggests having two steam passages connecting the tail-rod cylinder with the piston-valve chest. These passages would break out into the tail-rod cylinder at different heights providing cut-offs at say 25 per cent. and 50 per cent. of the stroke. The desired cut-off would be obtained by means of shut-off valves in the aforesaid steam passages. Actually, for a choice of two cut-off points it would be only necessary to have one valve, and that fitted in the passage connecting the valve chest with the tail-rod cylinder at the 50 per cent. level.

Diagrammatic Drawing

The engine is, of course, only drawn diagrammatically, but sufficient detail has been given to enable the modeller to produce his own ideas. As drawn, the piston-valve chest is far from ideal from the accurate machining point of view, as a portion is included in the common cylinder-cover and the same remark applies to the L.P. tail-rod in a lesser degree.

It will be noted that the steam inlet is into the tail-rod cylinder at the top and the exhaust on the side of the cylinder in which the piston-valve operates. The latter is indicated by dotted lines.

In considering the diagrammatic sectional elevation of the proposed engine, the following points will assist readers to follow the steam distribution.

A. Is the point of steam admission to engine.
B. Is the steam passage connecting tail-rod cylinder with piston-valve chest.
C. Steam port from valve-chest to H.P. cylinder.
D. Port connecting valve-chest with L.P. cylinder.
E. "Shown dotted." Exhaust opening from valve-chest to atmosphere or condenser.

TRUING A CRANKSHAFT

by K. N. Harris

RECENTLY a friend asked me to see whether I could true up a crankshaft he had made, which, when part finished, ran " out."

This was a double-web job and the crankpin was rather long and rather light.

The dimensions as I received it are shown in Fig. 1.

Fortunately, one end shaft had been left oversize, the maker having discovered the trouble before finishing it off.

The first thing to do was to find out where the error was. Fig. 2 shows the nature of the error, considerably exaggerated. The actual error was rather over 1/32 in. at the outer end, and it was evident that in some way the right-hand web had been strained.

The left-hand shaft, web, and the crankpin itself were true.

It might have been possible to " persuade " the shaft back into truth with a certain amount of brute force, but that is a chancy and unmechanical method, and might easily have resulted in the last state being worse than the first.

As one shaft, one web, and the crankpin were all true, it was obvious that if the true shaft were held in a collet the outer end could be turned true with the rest; the snag was, however, that with the comparatively weak crankpin and the long overhang, there would be an awful lot of spring, and if as a consequence a " dig in " occurred it would probably have meant curtains for the whole job.

The problem was to hold it in such a manner that the strain was removed from the pin, but the question was how.

After a certain amount of fruitless cogitation I put the job on one side, for I find that if you really get stuck, it is best to forget the job temporarily and get on with something else, when more often than not the solution will suddenly arrive. This method may not suit everybody, but it happens to suit me.

I was hunting for a bit of material for another job when I came across a lump of "Cerromatrix."

I now have some reason to doubt whether the actual alloy I used was " Cerromatrix," but it is one of the same general family, anyhow.

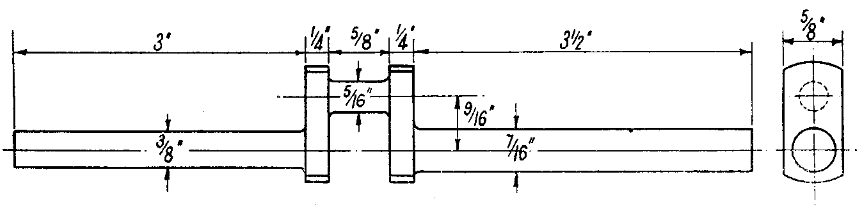


Fig. 1

For the benefit of those unfamiliar with this alloy, I would say that it is a fusible alloy melting well below the temerature of boiling water, and largely used for temporary (and sometimes permanent) set-ups by tool and die makers.

Here was the answer.

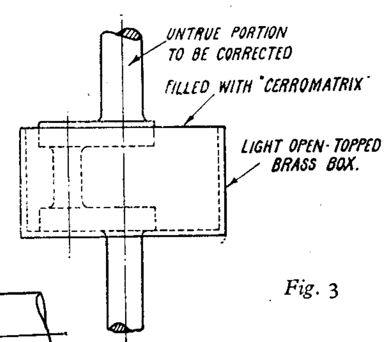


Fig. 3

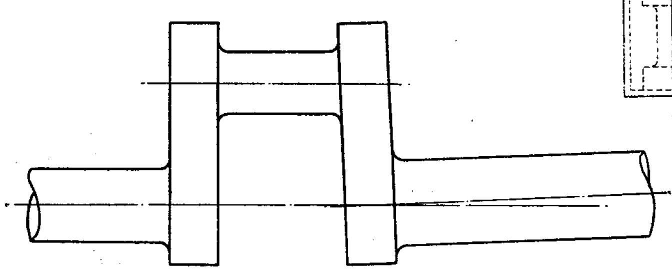


Fig. 2. *Error greatly exaggerated*

A little cylindrical brass box was made with an open end and a hole in the centre of the closed end, a good fit on the true leg of the crankshaft. The inside depth of the box was 1/32 in. less than the width over the crank webs. See Fig. 3. The box could have been made much smaller with the hole off-set, but was purposely made sym-

metrical to keep the balance good, as it was desired to do the machining at a high rate of revs.

This was slipped over the crankshaft and held vertically in the vice in such a manner that it could not slip.

A suitable amount of Cerromatrix was melted in a ladle and the box and crankshaft gently warmed to about the temperature of boiling water, and the melted alloy poured into the box. When set, the good end of the shaft was placed in the $\frac{3}{8}$ in. collet in the lathe.

From then on the job was a perfectly simple turning one. First, a short length at the outer end was skimmed up true, taking very light cuts with a very sharp tool, and the fixed steady mounted to carry it. Then sufficient of the shaft end was faced off to get rid of the existing centre and a new centre drilled with a Slocombe centre drill. The steady was removed and the outer end supported by the tailstock centre, after which all was plain sailing. The outer face of the untrue web was machined true, only the bare minimum of metal necessary to ensure this being removed—about 0.010 in. The inside of the faulty web was left as it was. Considerable additional work would have been involved in facing it up and the error was so small as to be quite unnoticeable to the eye, and, of course, was, for practical purposes, of no moment whatever.

The job was removed from the lathe and put in a saucepan of water, which was warmed up until the alloy ran out. A little circumspect treatment of the webs with a file completed a somewhat unusual job, and the result was a perfectly satisfactory and true running shaft. I make no claims for startling originality, for the principle is an obvious one, but I do not remember seeing it referred to previously.

These very low-melting-point alloys have considerable uses over a wide variety of techniques likely to be of value to the model engineer ; pipe bending is an obvious one, but there are many others, and I am quite sure that those readers of THE MODEL ENGINEER will be quite capable of developing the idea in many directions.

For the Bookshelf

Miniature Locomotive Construction, by J. H. Ahern, F.R.P.S. (London : Percival Marshall & Co. Ltd.) Price 8s. 6d. net.

This book, which deals with miniature, electrically-propelled locomotives, fills a conspicuous gap in model railway literature ; for, although several booklets have appeared from time to time, treating various aspects of the subject, there has heretofore been no really comprehensive work dealing with the construction of model locomotives in the smaller scales. We believe that this will remain the standard work on the subject for many years to come.

Of Mr. Ahern's credentials to produce such a work there is no question ; readers will know that the past files of *The Model Railway News* bear ample witness to his skill and versatility, both as an author and as practical modeller. He has written for the absolute beginner as well as for the more experienced worker, and has not confined himself to the construction of superstructures and the non-working parts above the running plate. In fact, the book describes the whole process of building a model locomotive, from the preliminary drawing board work and the adaptation of drawings to modelling purposes, through the construction of chassis and the mounting of motors to the final touches which can make or mar the appearance of the finished model. He has much helpful advice to offer on such matters as the proper meshing of gears and the construction of collectors for two- and three-rail. He has paid special attention to just those details which are most likely to baffle and intimidate the beginner, and which some writers are inclined to skip or gloss over just because they are difficult to describe clearly in words.

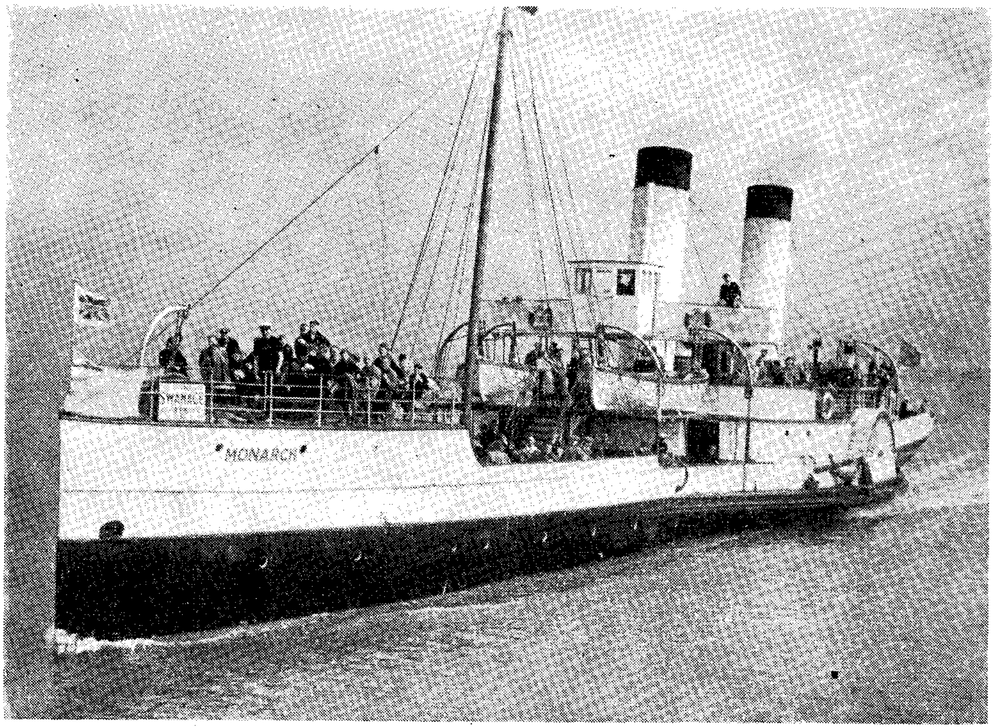
The diagrams are commendable, and are all specially drawn by Mr. Ahern to illustrate and elucidate the text. There are no blocks borrowed from manufacturers' catalogues, but every drawing deals with some specific point in the text. The same remarks apply to the photographic illustrations, and the author says in his introductory note : " I have not filled up precious space with photographic illustrations of *finished* model locomotives, which look pretty in a book but would contribute nothing to the beginner's knowledge of how to do likewise. It is hoped that the photographs which do appear in the following pages, of chassis and models in various stages of construction, will be more helpful." All the photographs were specially taken by Mr. Ahern and, in most cases, tell their story better than a line drawing or words could have done.

There are 162 line drawings, including a plate which gives details and dimensions of several of the motors now available in " OO " and " HO " gauges, and a dozen photographic plates. Special chapters are devoted to such subjects as bogies, cylinders, rods, and valve-gear, awkwardly-shaped running-plates and tapered boilers, outside-frame locomotives, special forms of gearing between motor and axles, such as combinations of worm and spur gear, tender drives, with flexible couplings and railcars. There are also chapters on American locomotives and the special problems they present, streamliners, and narrow-gauge locomotives. The book concludes with a useful note on re-scaling locomotive drawings.

Altogether, this is a book which contains something to interest everybody, and it should find a place in the library of any reader who is interested in miniature locomotives from (and including) " O " gauge downwards.

JUBILEE OF A MONARCH

by G. E. C. Webb



P.S. *MONARCH* recently passed her sixtieth birthday. She is an interesting vessel, not only on account of her Jubilee, but also because she represents a type of paddle steamer which is gradually disappearing. Her two slender buff funnels with their steep rake, and indeed her appearance generally, clearly belong to the 19th century.

Built in 1888 by Messrs. R. & H. Green, of London, she was engined by Messrs. J. Penn & Son, also of London. She was not fitted with the usual two-cylinder compound, however, for although her engines have the familiar diagonal disposition, her two cylinders are both 41 in. bore by 48 in. stroke.

She is 210 ft. long and 22.2 ft. in breadth with a depth of 9 ft. and her registered tonnage is 129 nett and 315 gross. She has a steam capstan on her forecastle and another aft, used to haul the vessel alongside when berthing. Her hull is black above the waterline and green below, bulwarks, paddleboxes, etc., being white, separated from the black of the hull by a narrow band of deep yellow. The name *Monarch* on her bows is in blue with yellow shading, but on her paddle-boxes the name is in gold on a dark blue ground.

In the 1914 war *Monarch* did valuable service as a minesweeper; during the recent war she was called upon for further service, this time as an examination ship.

She belongs to Messrs. Cozens & Co. Ltd., of Weymouth, whose fleet operate in conjunction with ships of the Southampton, Isle of Wight and South of England Royal Mail Steam Packet Co. Ltd., of Southampton, who own the old iron paddle steamer, *Lord Elgin*, described in THE MODEL ENGINEER for July 31st, 1947.

This ship would make a very suitable prototype for a model and would be a welcome change from the more modern type of paddle steamer. In years to come the historical value of an accurate and carefully made model would be quite considerable, especially as the prototype belongs to a period which has been greatly neglected by the ship modeller. A simple two- or three-cylinder oscillating engine could be used to drive the paddles, as, although it would probably need to drive through a pair of reducing gears, the cylinders could be set diagonally and thus the power plant would bear quite a resemblance to the original. The radial slots in the paddle-boxes, not usually seen in the modern type paddler, form a very decorative feature and one which gives scope for some nice craftsmanship.

Locomotive Testing at Sunderland

by T. Richwood

THE Stephenson Memorial Miniature Locomotive Association held its first meeting on September 4th in Roker Park, Sunderland. The competition proper could not be held because time would not allow for arranging all details. Since it was necessary to prove the rules, a rally was held under competition conditions. Visitors came from Carlisle, Chester-le-Street, Bishop Auckland, Newcastle and, of course, Sunderland.

The locomotives were: Mr. Brown's 5 in. gauge 0-6-0 (Eva May); Major Lawson's $3\frac{1}{2}$ in. gauge 2-10-0 (Henschel); Mr. Preshous's $3\frac{1}{2}$ in. gauge 4-4-2 (Maisie); Mr. Swaine's $3\frac{1}{2}$ in. gauge 4-4-0 (Miss Ten-to-Eight); Mr. Murta's $2\frac{1}{2}$ in. gauge 4-4-2 (free-lance); Mr. Atkinson's $2\frac{1}{2}$ in. gauge 2-6-2 (free-lance); Mr. Robinson's $2\frac{1}{2}$ in. gauge 4-6-2 (free-lance 3-cylinder) and Mr. Dents $2\frac{1}{2}$ in. gauge 2-8-0 (Austere Ada).

The formula evolved was:

$$\frac{\text{No. of laps or journeys} \times \text{load in lb.}}{\text{Theoretical T.E.} \times \text{total fuel in oz.}}$$

The load was composed of 112-lb. sandbags and the driver. The time allowed was 10 minutes from a standing start without any artificial assistence. The fuel factor was inserted in the formula to penalise the driver who could not drive in the best "locomotive" fashion. It is now a debatable point whether or not to keep it in the rule. The figures when calculated with and without this figure show marked differences.

The Sunderland track is laid with 1 in. scale brass rail, and much has been said about the merits and demerits of this and steel rail. Major Lawson's "Henschel," which pulled over a ton at the opening of the Middlesbrough track recently, pulled a load of 1,050 lb. on this track and this seemed to be the limit. The loaded cars were far from an ideal set-up, because bags were laid across the truck ends and caused friction on the curves. All drivers were emphatic on the great difference between "live" and "dead" loads and reckon that a greater weight of "live" load can be carried than of "dead" load. Since, theoretically, 100 lb. exerts the same pressure on the rails whether dead or alive, it is difficult to understand where the difference comes in, but it was demonstrated later. What do others have to say about this?

During the running of the competition much amusement was caused when Mr. Swaine, whose spectacles steamed up from the safety valve's blow off, dropped his cap over the boiler top. A wag asked the judges if he was not cheating by increasing the adhesion. Another amusing incident was the finishing of the run by Mr. Dent on "Austere Ada" with the smallest fire in the grate ever seen. Mr. Dent is a main line driver and he certainly earned his "coal money." Incidentally, the low amount of fuel he used placed him well up the list of competitors.

The 5-in. gauge "Eva May" could not be loaded up to capacity, so the figures for this engine are not a true record of its capabilities. It romped round the track with the lever 1 notch off the middle and put up a fine performance.

Mr. Robinson's 3-cylinder Pacific was not up to scratch because of the inexperience of the driver. He had only had about 1 hour driving previously and this is not sufficient by far for a trial of this sort. This locomotive is reputed to be one of the finest $2\frac{1}{2}$-in. "gaugers" ever seen. The valve-gear, which is conjugated for the inside cylinder, is a beautiful piece of craftsmanship.

The official figures are shown in the table below.

More committee work is to be done to determine whether the above rule ought to be altered to place every competing locomotive on an equal basis or if this is the best possible means of determining the champion locomotive of the North East. All constructive criticism is welcomed, preferably in "Ours" so that all may derive benefit.

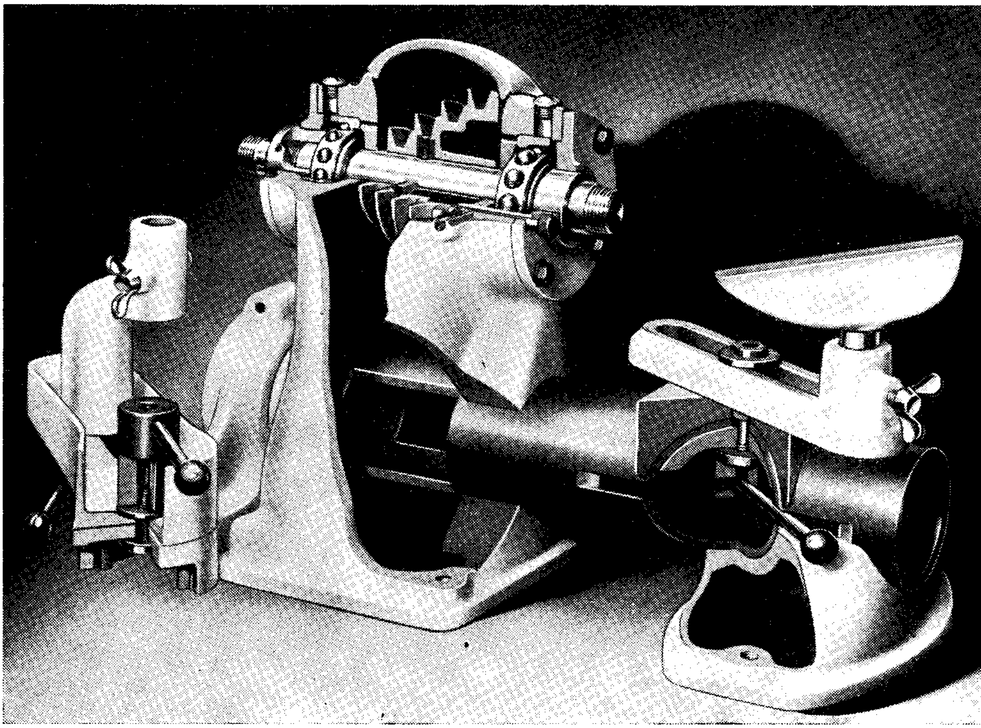
																Order of Merit	
	Gauge	Type	Bore	Stroke	Driver dia.	T.E.	Pres. lbs. sq. in.	Laps	Load	Tare	Driver	Total	Fuel used	Factor	Factor without fuel	With fuel	Without fuel
			in.	in.	in.	lb.							ozs.				
(1)	$3\frac{1}{2}$	2-10-0	$1\frac{1}{2}$	$1\frac{5}{8}$	$3\frac{1}{2}$	71	80	23	784	90	176	1,050	14	24.3	340	5	5
(2)	$2\frac{1}{2}$	2-8-0	$\frac{15}{16}$	$1\frac{1}{4}$	$2\frac{1}{4}$	33.3	80	20	336	41	115	492	9	32.8	295	2	7
(3)	$2\frac{1}{2}$	4-6-2	$\frac{11}{16}$	$1\frac{1}{8}$	$3\frac{21}{32}$	16.7	90	11	336	41	177	554	15	24.3	365	4	4
(4)	5	0-6-0	$1\frac{1}{8}$	$2\frac{1}{4}$	5	68.5	80	26	1,232	113	163	1,508	35	16.3	572	8	3
(5)	$3\frac{1}{2}$	4-4-2	$1\frac{1}{4}$	$1\frac{5}{8}$	$4\frac{3}{4}$	34	75	17	560	62	138	648	14	23.1	323	6	6
(6)	$2\frac{1}{2}$	4-4-2	$\frac{25}{32}$	$1\frac{1}{16}$	$3\frac{1}{8}$	15.9	90	20	336	41	176	553	14	49.6	695	1	2
(7)	$3\frac{1}{2}$	4-4-0	$1\frac{5}{16}$	$1\frac{5}{8}$	5	30.5	60	27	560	62	195	817	24	30.1	722	3	1
(8)	$2\frac{1}{2}$	2-6-2	$\frac{13}{16}$	$1\frac{1}{8}$	$2\frac{11}{16}$	21.1	90	10	336	41	177	554	12	21.8	262	7	8

Owners: (1) Major Lawson; (2) Mr. Dent; (3) Mr. Robinson; (4) Mr. Brown; (5) Mr. Preshous; (6) Mr. Murta; (7) Mr. Swaine; (8) Mr. Atkinson.

A New Myford Wood-turning Lathe

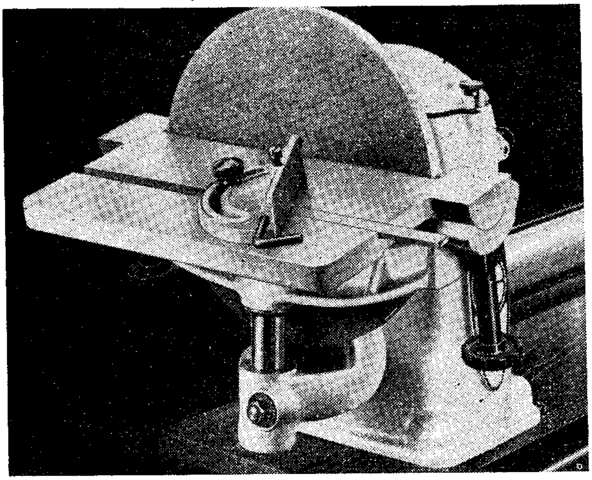
THE craft of the wood-turner is one of the oldest in the world and, generally speaking, neither the lathes nor the appliances used therein have changed very much in the course of modern industrial evolution. Although the primitive forms of dead-centre pole or bow lathes have been almost completely superseded, at least in this country, the orthodox form of woodworking lathe consists of little more than a " live " headstock, adjustable tailstock and hand rest, on a bed either of wood or metal. This severely simple but highly versatile and adaptable machine tool has hitherto sufficed for most practical purposes, even when work of the highest accuracy was called for, such as in pattern making, and its range of operations has been widened, where necessary, by the addition of simple attachments, mostly improvised, as and when required ; only in special quantity production work has it been deemed necessary to add mechanical movements or other elaborate fittings to such lathes.

The position, however, has rather changed at the present day, when the field of industrial production has become immeasurably wider, involving new manufacturing problems and new emphasis on rate of production ; the universal adoption of power drive has also made it necessary to improve the structure and mechanical details of even the simplest machines, to enable them to take advantage of potentially greater power capacity and higher speeds. While this does not necessarily rule out the development of the conventional forms of machine design, it at least emphasises their inherent weaknesses, and constitutes a sound reason for exploring new ideas and constructional principles.



A partly sectioned view, showing the headstock and clamping devices, and with short bed fitted

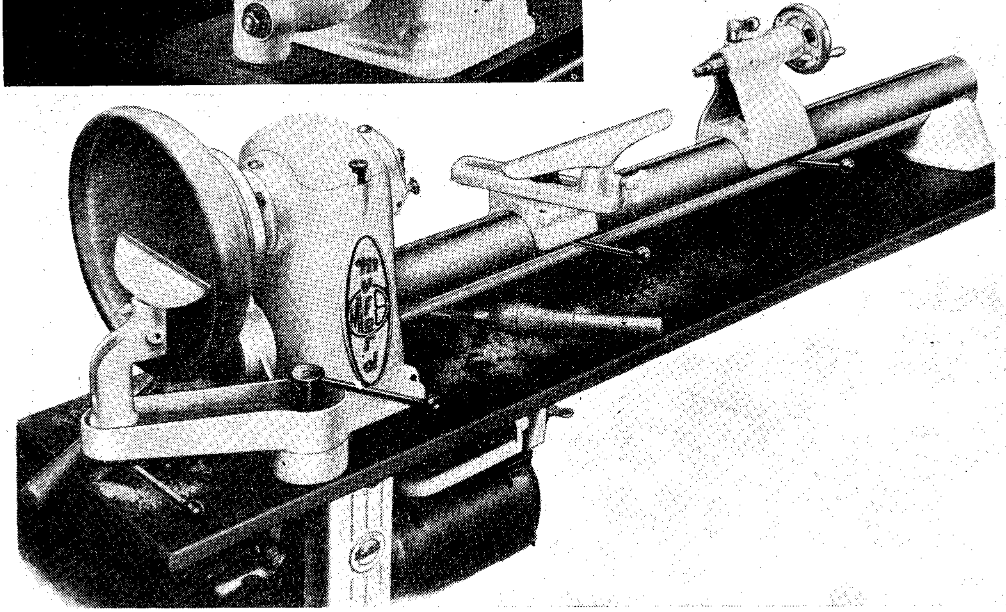
It is, of course, easy to elaborate the design of any machine and improve its equipment by a process of simple addition, but in doing so, there is a risk, not only of rendering it too expensive to appeal to the class of worker for which it is designed, but also of interfering with its handiness for the simpler forms of work. Some machines have been produced which are marvels of ingenuity, and a joy to the connoisseur of high-class equipment, but which are actually of less utility to the practical worker than the primitive type of machine. Real improvement



Specification of the M.L.8 Lathe

The primary mechanical component of this lathe is the " live " headstock, which consists of a hollow casting in light alloy with a broad base for bench mounting, and bored horizontally to take the cylindrical bed and mandrel bearings. It is of clean external form and is fitted with a top cover plate, which entirely encloses the mandrel and driving pulleys, the drive being taken through the hollow headstock casting from a motor fitted below the lathe bench.

The mandrel has an outside diameter of $1\frac{1}{8}$ in. and runs in two heavy-duty



Above.—Sanding attachment on left-hand end of mandrel. Below.—View from headstock end, showing work on faceplate and rear turning attachment in use

lies in the retention of basically simple design, with improved mechanical details, and the addition of readily fitted, and easily manipulated accessories, to increase scope and versatility.

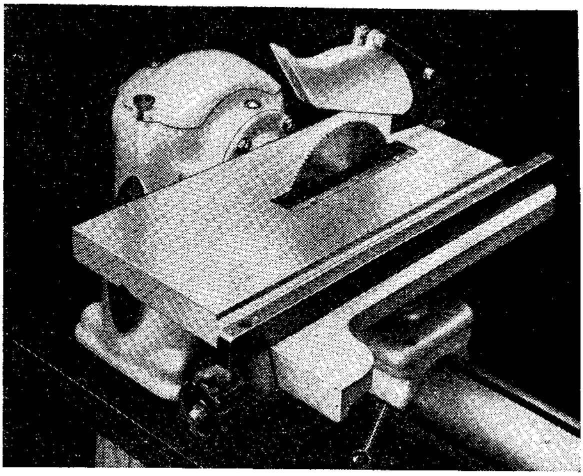
With these objects in view, the Myford Engineering Company, of Beeston, Notts., who are already well known as exponents in the progress of design in small metal-turning lathes, have lately turned their attention to the particular problems of the woodworker, and have evolved a lathe for this purpose, which embodies many distinctive and ingenious features. This machine, while highly suited to the use of the individual worker, either amateur or professional, has a much wider scope of application in the field of productive industry, being capable of standing up to continuous heavy duty, and it is equally suitable for use in technical training establishments and factory workshops.

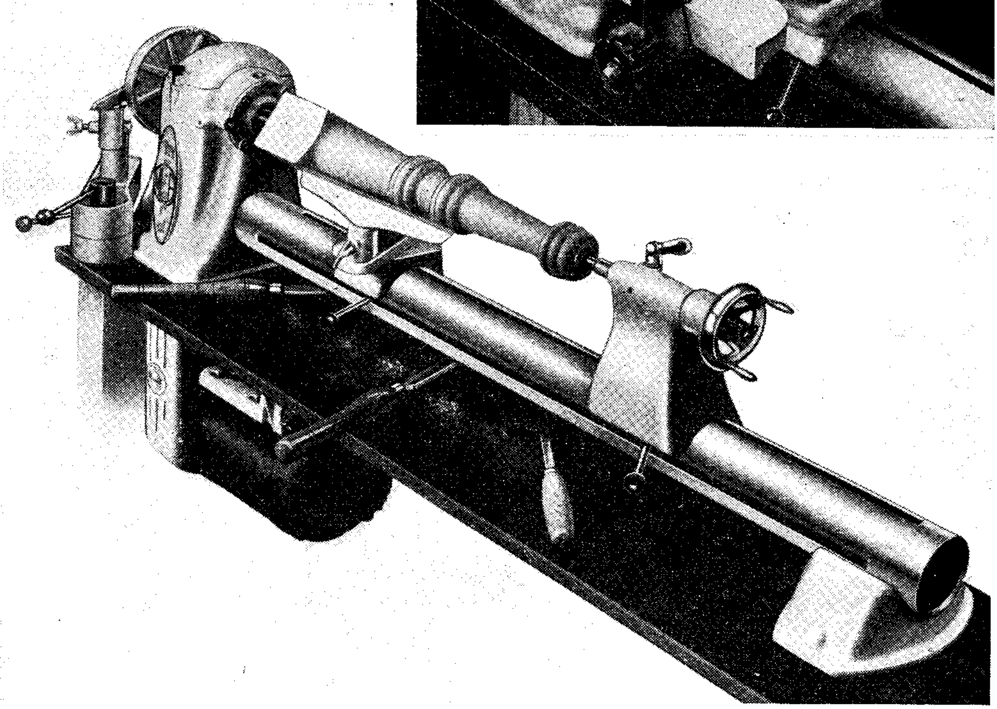
angular-contact ball-races, which give full support to both radial and axial thrust loads, and end play is adjustable by the usual screwed collar. A 4-step cone pulley for $\frac{1}{2}$ in. vee belt, giving speeds of 712, 1,140, 1,780, and 2,850 r.p.m. from a standard motor running at 1,425 r.p.m., is rigidly attached to the mandrel, which is bored 13/32 in. diameter right through, and tapered No. 1 Morse at the nose. Both ends of the mandrel are screwed and registered for the reception of chucks and faceplates, the outer end position being used for large diameter work beyond the normal swing capacity over the bed. An indexing device, giving 24 positions, is provided on the headstock pulley.

The lathe may be driven from a countershaft below the bench if desired, but the normal " motorised " drive entails the use of a hinged motor platform with a baseplate for attachment

to the underside of the bench. This provides for adjustment of belt tension and speed changing, the latter being facilitated by access to the headstock pulley obtained by removing the headstock cover plate.

A tubular bed of patented design is fitted, made from 3 in. diameter heavy gauge seamless steel tubing, dull-nickel plated to resist corrosion. This is clamped to the lower bore of the headstock at one end, and supported at the other by a saddle casting mounted on the lathe bench. The tube is slotted throughout most of its length to permit





Above.—The circular sawing attachment. Below.—The Myford M.L.8 lathe, with work set up between centres

the movement of the saddle and tailstock clamping devices.

The tailstock is of the hollow barrel type, bored 13/32 in. diameter, and tapered No. 1 Morse, the same as the headstock. Its base is machined to fit the curvature of the bed, and it is held in place by a single bolt with a shaped pressure pad and clamp-nut inside the bed, operated by a quick-action lever. A similar device is fitted to the hand rest, which is of fairly normal design and seated on a saddle-piece machined to the contour of the bed ; the clamping lever simultaneously locks all movements of the rest, except the vertical height adjustment, which is equipped with the usual hand screw.

Capacity

The length admitted between centres is 30 in. but beds of special length can be supplied, either longer or shorter than the standard dimensions. The swing over the bed is 8 in. diameter, or at the left-hand end of the mandrel, 12 in. diameter can be turned when using the special rest. The clear swing over the bench, when no rest is fitted, is 16 in. diameter. The standard equipment includes the motor platform, 4-step pulley for motor, No. 1 Morse taper prong centre, No. 1 Morse taper cup centre for tailstock, 10 in. standard hand rest, and one faceplate for right-hand end of mandrel.

The design of additional fixtures and appliances,

on which the versatility of a simple lathe must largely depend, has been very carefully studied, and considerable ingenuity is displayed in these devices, which include attachments for circular sawing, rotary planing, sanding, polishing and rear turning ; also, a compound slide for turning metal and plastics, and special tools, centres, adaptors, etc.

Attachments

The circular saw attachment comprises the usual saw mounting mandrel and saw table, but the latter is much larger and more robust than is usual for lathe attachments, the dimensions being 14½ in. × 12½ in., and it is mounted on the saddle of the hand rest, to which it is attached by cap screws. It is equipped with a tilting table with rigid clamps, having a range from 0 to 45 deg., and also parallel work fence with front and rear locks, mitre gauge, saw guard and splitter. On account of the heavy-duty bearings fitted to the lathe, it is unnecessary to support the tail end of the saw spindle, allowing a greater range of angle and cutting depth and improving accessibility. The maximum depth of cut with a 7¾ in. diameter saw is 2⅝ in.

A rotary planing attachment is now in course of development, and will embody a cutter cylinder with inserted blades, and an elevating table with angular adjustment to the fence. The sanding attachment is fitted to the left-hand end of the mandrel, and comprises a 10 in. diameter faceplate for the mounting of abrasive discs, also a work table 11 in. × 8 in., with tilting adjustment up to 45 deg., fitted with an angle gauge. For polishing, an adaptor can be supplied with a taper-ended extension to carry mops or buffing wheels.

The rear turning attachment includes a special faceplate for mounting at the left-hand end of the mandrel, and a bracket clamped to the end extension of the tubular bed. This carries a horizontal arm with swinging adjustment, on which is adjustably mounted a support for the standard hand rest. Both movements are locked by quick-action clamps.

By the fitting of a compound slide-rest in place of the hand rest, the usefulness of the machine for accurate work in hard wood, plastics or soft metals, is increased, and machines with a short bed and slide rest have been applied industrially as " second-operation " or finishing lathes in production factories, being highly suitable for simple operations on part-finished components, thus releasing expensive and elaborate lathes for more important work. A quick-release collet chuck can be supplied in cases where the machine is applied in this way.

Rapid Production

The Myford lathes, including this latest product, are produced in a factory organised and equipped for rapid and accurate production. From an inspection of the methods employed in the manufacture of the M.L.8 lathe, we are convinced of their efficiency, and that they enable a high-class product to be sold at a competitive price. All components of the machine are produced to close limits of accuracy, using jigs and inspection gauges to ensure interchangeability. Although alignments and other dimensional and angular limits are of much less importance on a lathe of this type than on a metal-working machine tool, they are closely controlled, and it may be mentioned that a special-purpose machine has been evolved for boring the housings of the mandrel bearings and the round bed in the headstock casting, in order to ensure perfect alignment and exact sizing of these bores.

The appearance of the finished machine, as may be seen from the photographs, is clean-cut and distinctive, and this factor, combined with the unquestionable ingenuity and efficiency of the design, has led to a large demand, especially for the export market, where it is already contributing substantially to British trade and prestige. Particular attention has been paid to the packing of the machine for export, to economise space and ensure safe transit. It is sent out in a dismantled state, and in addition to a well-produced instruction leaflet explaining the method of assembly, templates are supplied to show the positions of holes for mounting the machine on its bench.

AN INEXPENSIVE DIAL TEST GAUGE

CERTAIN aircraft instruments operated by atmospheric pressure, such as those indicating rate of climb or m.p.h., can be converted into dial test gauges by removing the operating bellows or diaphragm, and replacing it by a rod projecting through the case.

A rate of climb meter was obtained for a very small sum, and it proved to be easily adaptable. It was necessary to reverse one crank in order to operate the dial from a push rod instead of the suction diaphragm, but this was quite a simple matter. The push rod was made from a darning needle supported in suitable guides ; the end of the needle, which projected through a hole made in the case of the instrument, had a small bronze ball pressed on it.

The dial was calibrated, and was found to cover a range of 80 thous. The scale is not linear, but is most open around the centre (zero) point, which is, on the whole, an advantage.

This gauge has been found to be quite accurate and very useful. The principal disadvantage is its large size, although part of the case was cut off to reduce this as far as possible. The instrument used was of American manufacture and had jewelled bearings.—A. M. TUCKER.

Fusible Plugs for $\frac{3}{4}$-in. Scale Locomotives

by F. Cottam, A.M.Inst.Mech.E.

ALL steam locomotives, except those of the " fireless " variety, in this country are fitted with a fusible plug, or plugs, in the firebox crown.

These plugs are a safety device, the metal filling fuses when the water level is allowed to fall below the firebox crown, the rush of steam into the firebox damps down the fire and may prevent the firebox crown from overheating and collapse.

The " safety " feature of the fusible plug lies in the fact that, should the firebox crown become overheated either through shortage of water or excessive scale the plug fuses and the engine crew are soon aware that something is wrong by the hissing in the firebox and sudden pressure drop. The usual drill then is to get both injectors on, if their failure is not the cause of the trouble. If this is the case, stop, drop the fire and knock brick arch down.

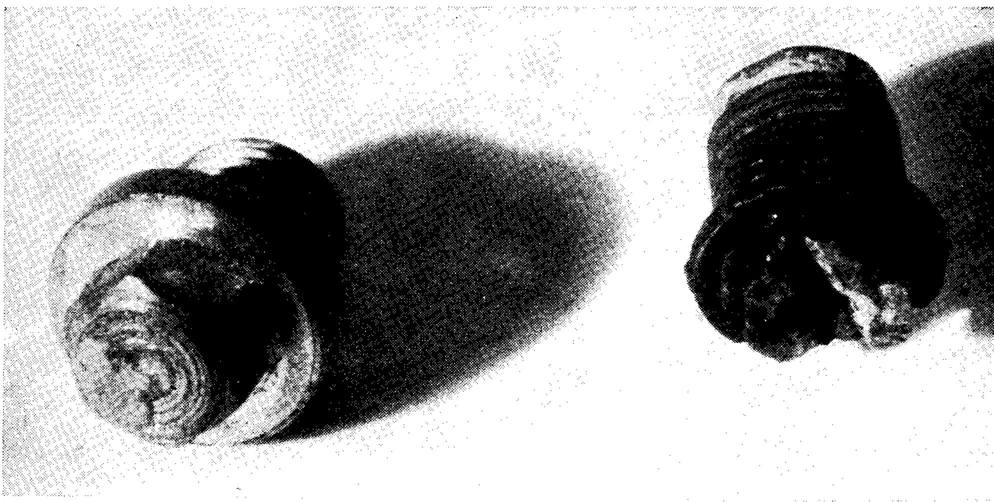
The engine must then be towed to the locomotive shed where the boiler and probable causes of failure are thoroughly examined before the engine goes back into service.

Therein lies the " safety " aspect.

Should the engine be working hard when the firebox crown becomes dry the result is sometimes the collapse of firebox roof, with disastrous results to the engine and crew.

A sketch of the approximate dimensions of a fusible plug on a full-sized locomotive is shown. One, two or four are usually fitted. Two may be fitted, one near front, other at back end, offset from centre line, one to left, other right. Four are sometimes fitted in a large firebox, one near each corner.

The body of the plug is of phosphor-bronze, or alloy, with a taper thread and is fitted direct to firebox crown plate. A hole of approx. $\frac{1}{2}$ in. diameter is drilled through body, countersunk at top end. A whitemetal core is run into plug, after it has been heated and tinned. Owing to the top of plug being countersunk the fusible core cannot be forced out by pressure alone. The metal is formed with a half-round head on which the date of installation (which is periodical and recorded) is stamped on. The plugs are also taken out for examination on " wash out " days.



Left—Plug as now fitted. Right—Original plug, which fused and was removed with a punch

The bore of the plug is not filled throughout its length, the bottom end nearest the fire, usually about an inch, being left hollow, the reason for this being that the lower end being right in the fire space becomes too hot for the fusible meta to remain solid.

The plug body is squared on its lower end. If this part were made larger it would perhaps be easier to remove but the plug would become overheated.

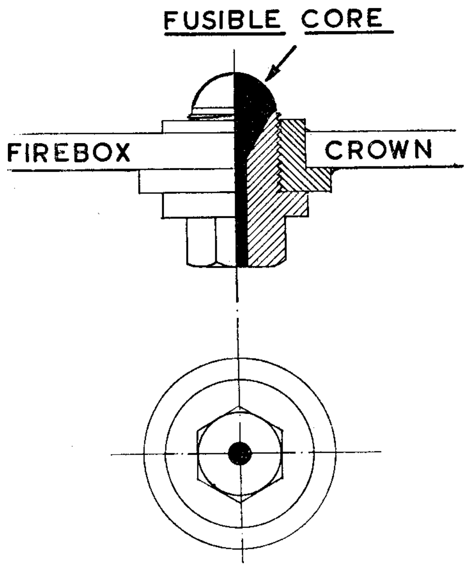
Another type of plug has, instead of a whitemetal core, a straight brass core sweated in. A much larger core could be used. This feature may be useful on a small scale boiler, but the increased rush of steam on a full-sized engine would perhaps be dangerous to the engine crew, and this type is not used so far as the writer is aware, in locomotive work.

These notes were prompted by the results of

some experimental lead plugs fitted to a $\frac{3}{4}$-in. scale "King" class locomotive.

Drawings show dimensions of plug and its location in firebox. On the $\frac{3}{4}$-in. scale "King" one only is fitted, at front end of firebox where it is easily accessible for removal via the dump part of grate and ashpan, with a long 5-B.A. box spanner.

This accessibility business was given a good deal of thought, bearing in mind the time and labour involved should the boiler have to come off the frames if the plug ever required attention. In its present location the plug on the "King" can be replaced in a few minutes.



Plug fitted to a $\frac{3}{4}$-in. scale firebox

The plug is turned from $\frac{3}{8}$-in. brass, threaded $\frac{1}{4}$ in. × 40, drilled $\frac{1}{16}$ in. and countersunk with a Slocombe drill. This is done at one setting, then parted off, reversed in chuck, faced off and 5-B.A. hexagon head filed up. Make two or four, double the number you intend fitting. The spare ones may be useful at the track meeting.

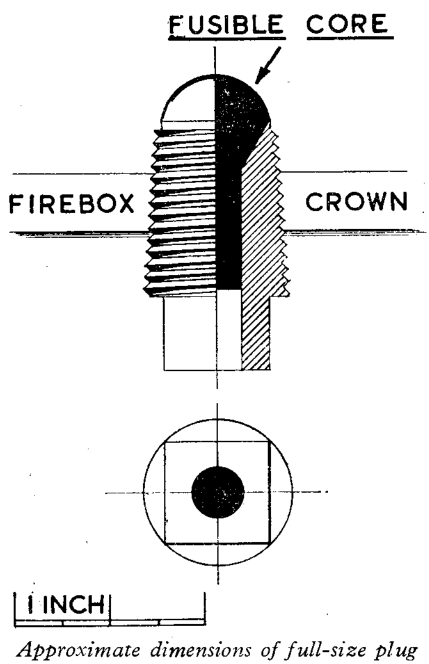
Fusible metal is soft solder (melting point about 400 deg. F.). Stand plug, hex end down on a piece of thick metal and get busy with a small blowlamp or gas flame. Dip the end of a stick of solder into Baker's fluid and melt off into top of plug. With care and not too much heat it is easy to fill the core and form a nice half-round top. Tinman's soft solder has been found suitable for a boiler working at 75 lb.; if the boiler is to be pressed at over 100 lb. a higher melting point soft solder may be required, this, however, would be a matter for experiment.

The plug is screwed into a $\frac{1}{4}$ in. × 40 bush silver-soldered into firebox crown. A smear of plumber's jointing was rubbed on threads before fitting. Graphite is rubbed into threads of full-sized plugs before fitting to facilitate removal. This may be worth trying on the small edition instead of plumber's jointing. Two points to note: There should be no threads on the plug standing proud of bush and protruding into water space when plug is fitted or they will become furred over, making the plug difficult to remove. Make the hex head a full $\frac{1}{8}$ in. in length. The writer's first plug had the hex head $\frac{1}{16}$ in. long—it had to be removed with a punch as there was not sufficient metal for the box spanner to grip.

In practice this plug has proved to be very successful. On one occasion, due to the water gauge becoming blocked the plug melted out and the fire was quickly extinguished, some of the finer ash being blown out on to the footplate. As a matter of interest the boiler was removed from frames to enable a closer examination of any possible damage to be made. In this boiler the stayheads are caulked with soft solder, which showed no signs of damage or movement.

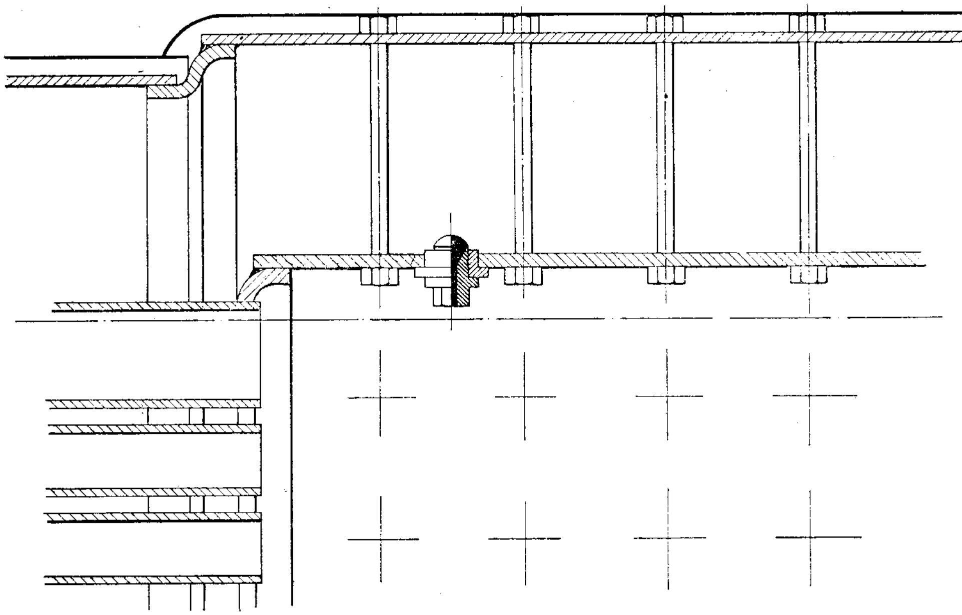
It is regretted that the amount of water remaining in the boiler was not measured. In any case, this would have been difficult as some was probably carried over into the firebox by the rush of steam. It is estimated that the boiler was about one-third full when the plug fused and that most of the firebox sides and tubes were covered.

While one plug is considered sufficient on a narrow firebox boiler two could with advantage be fitted over a wide grate.



Approximate dimensions of full-size plug

Their use can be recommended, especially if any soft solder is used in the boiler. Even with an all-brazed boiler it is surely not a very comforting thought to know that the boiler has been run dry, which only seems to happen when there is a nice white fire in the box.



Location of fusible plug in firebox

Editor's Correspondence

"Papworth" and Others

DEAR SIR,—Regarding the photograph of the Fowler engine "Papworth," lying by the side of the road at Leverstock Green, published in your issue of August 19th, 1948, this engine worked, with another of similar type, in the St. Albans district during the 1920's. I can remember this one in the Aldenham, Watford and Radlett districts on cable ploughing, as there were not many engines with a bell-topped dome, which is undoubtedly a sign of antiquity. "Papworths'" makers' number was 2942 and most of the engines now in existence, of this make, have numbers in the 4,000 or 5,000's. The spring-balance safety-valve was marked from 80 lb./sq. in. to 200 lb./sq. in., there were 24 tubes in the boiler about 2 in. diameter, a feed pump, driven by an eccentric on the crankshaft was arranged horizontally on the top of the firebox, the crankshaft was of the "bent up" variety and the front axle was carried on an extension bracket standing out from the front of the smokebox, so as to increase the wheelbase. Weight was 10 tons. The regulator rod worked into the back (nearest the chimney) end of the cylinder block, with a reverse lever (clearly shown in the photograph).

The following notes refer to "Papworth": April 6th, 1942, "Papworth" being oiled and cleaned and covered with tarpaulin sheet."

March 27th, 1943, "Papworth" still in same position carefully sheeted down, but now chimney missing. 2 ploughing engines less chimneys and one big Burrell threshing engine in yard, in working condition, behind "Papworth."

June 28th, 1947, "Papworth" still at Leverstock Green. Few fittings missing i.e. one of the link pins from valve gear. Robbed for spares?

This engine was standing where it is now before the war and there used to be another (? its partner) as well. I lived at Radlett till 1930 and often saw this engine standing or working before that date.

Last year I was offered a similar engine, but more modern, reputed to have been built in 1910, and *without* the dome, for £40. This had been used to drive a log saw.

The following notes may be of interest to your correspondent, Mr. Boddy, of Fleet (in your issue of July 8th).

In 1936 there was at Cane End, between Henley and Reading, a veritable museum of old engines in a field. I have a note, September 16th, 1936 of 2 Fowler ploughing engines with domes, 1 single-cylinder threshing engine, 1 large 2-cylinder Fowler "road locomotive" of immense height, a Garrett steam wagon (? 2-cylinder compound), a Foden steam wagon and cross boilered "Yorkshire" wagon. On April 15th, 1938, I note all these engines were being cut up for scrap.

February 2nd, 1943, in a field at Penton Hook, near Staines, 2 very large single-cylinder ploughing engines and double ended six furrow plough marked "B. Fowler, Steam Plough Works, Leeds, 1873." Engines have very long smokeboxes and one cast iron bell topped chimney and other usual "stove pipe" type. Road licence expired December 31, 1940. Both these engines have an unusual arrangement of steering, the drag chains from front axle being jointed to rods carried *under* the firebox to a geared arrangement under the coal bunker and worked by a vertical shaft on the left-hand side of the coal bunker so that the steering wheel is at the extreme rear of the engine. The rods work in slides and are moved by a block chain lapped round a wheel, geared to the handwheel shaft. The steersman stands on a footstep projecting from the left side of the bunker. They must have been brutes to steer! Plate on front axles "12 tons."

August 28th, 1944, 2 engines at Penton Hook have been moved.

These engines belonged to Herbert Ward of Egham, may still be in existence.

I can give notes of other engines, including 2 Fowlers and 2 threshing engines at Brookland, in Romney Marsh, last year. Two threshing engines, one in working order, old Ransome Sims, at Lydd, Kent, last year and a yard full of threshing engines, some in steam, at Chailey, Sussex, last year, if Mr. Boddy is interested.

I should like to know if anyone knows if a specimen of a Fowler double drum ploughing engine still remains anywhere. I have seen a model, supposed to represent a type used in the late 1860's of one of these engines, which hauled the plough both ways, the rope passing round an "anchor" pulley at the far end and the engine having 2 drums for alternately pulling. The model showed the engine constructed with the small front wheels under the firebox and the driving wheels at the smokebox end, cylinders on top of the firebox and driving toward the smokebox, and the steering arranged so that the engine travelled "bunker first." The 2 drums were put under the boiler, one each side of the driving axle, and this presumably is the reason for the unusual design.

Another interesting specimen would be a McLaren steam digger (as distinct from ploughing engine) of 1880 when, I believe a machine for this purpose was brought out.

Yours faithfully,

Iver. R. S. ROTHWELL.

Old Watch Lathe

DEAR SIR,—With reference to the Editorial and photograph of the above in No. 2458, and the letter by Mr. J. C. Piguet in No. 2469.

These semi-circular balance rims were not rare, as rather inferred in your Editorial, but were practically standard on all the Victorian era watches with cylinder escapements. In addition, not a few of the more or less contemporary English lever watches with large steel uncut balances had rims of circular (in this case not semi-circular) section.

The numbers made of the former must have been very large, even if they did not run into millions, but many of them were only rounded a bit, and by no means a true semi-circle.

Yours faithfully,

Bognor Regis. C. S. COWPER-ESSEX.

Universal Milling Attachment

DEAR SIR,—It was with some surprise that I read the article by your contributor "Ned" on "Tools and Equipment at the 'M.E.' Exhibition," in the October 14th issue of "ours."

In his criticism of the above exhibit, namely, a Universal Milling Attachment and base for a 4-in. Drummond lathe (round bed), "Ned" evidently missed the meaning of the word "universal" He states that—"it is interesting to note that by fitting it in this way neither longitudinal nor cross-traversing movements are possible." The term "universal" as applied by the constructor does not mean only adjustments, as was stated in his article.

If your contributor examined my exhibit he would find that the central bolt from the base clamp holds the milling attachment secure, by undoing the top nut and substituting a tee-headed bolt on the cross slide the milling attachment then becomes useful for milling operations between centres and on work held in the chuck or faceplate only, the attachment has been used in this way on numerous occasions. But to further widen its scope I designed the base clamp and further improved the milling attachment by virtue of being able to clamp work on the cross-slide and use the said slide as a milling table, thereby enabling me to use the longitudinal and cross traversing movement of the lathe plus the vertical rise and fall of the attachment.

I trust, therefore, that my term "universal" is now amply explained and does not mean only "adjustments" as stated by your contributor. Furthermore, the attachment, as illustrated on page 398, is more substantial and steady than when bolted on the cross-slide.

If any of your readers have a round-bed Drummond and would care to borrow the patterns for the base clamp I would be pleased to loan same if they would write to the address below.

Yours faithfully,

Trenwith, Perranporth. W. C. TRUSCOTT.

DEAR SIR,—I have noted the review by "Ned" in the October 14th issue on "Tools and Equipment at the 'M.E.' Exhibition," and his comments on the Universal Milling Attachment made up from my set of castings by Mr. W. C. J. Truscott, and fitted with clamp to mount on the bed of a 4-in. round-bed Drummond lathe.

The purpose of this clamp has apparently been missed, as by its use the attachment converts the lathe into a small milling machine, *the work being mounted on the slide rest or the boring table of the lathe.* It will be seen that vertical, horizontal, and cross traverse are all available, and further the spindle can be swivelled from vertical to horizontal.

Standard mounting saddles are available for the 3½-in. Drummond and Myford M.L.7 lathes, which can also be adapted to a number of similar size lathes.

Yours faithfully,

Denbigh. G. P. POTTS.